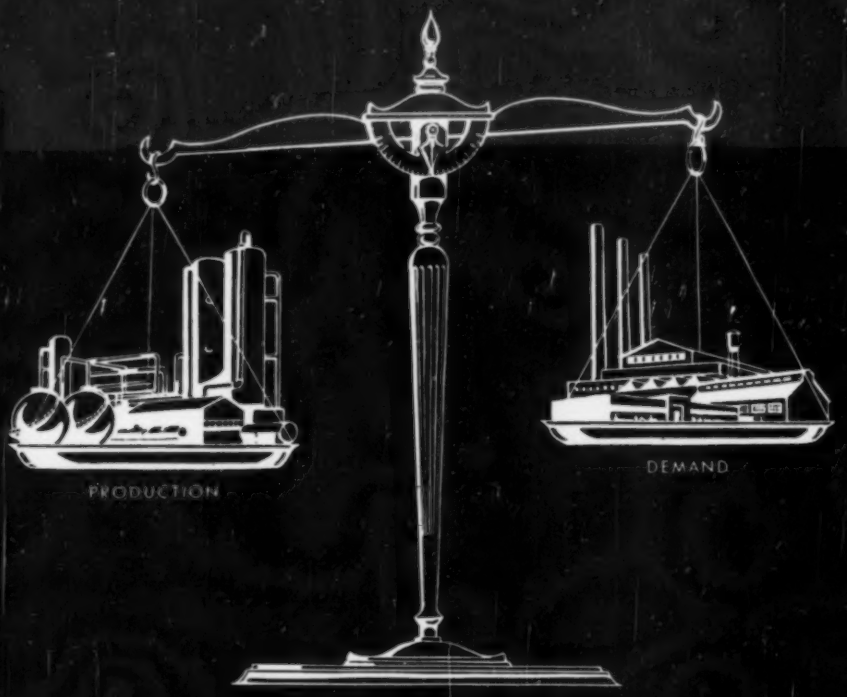
NATIONAL EDITION

FEBRUARY
1949

CHEMICAL ENGINEERING

WITH CHEMICAL & METALLURGICAL ENGINEERING

Chem Eng



Featuring this issue is Chemical Engineering's 26th annual review focusing attention on economic and technical factors affecting future markets for chemical raw materials and products. Also articles on hydrogen cyanide produced by direct synthesis, how Durez makes formaldehyde, and the magnesium oxide process for sulphite pulp.

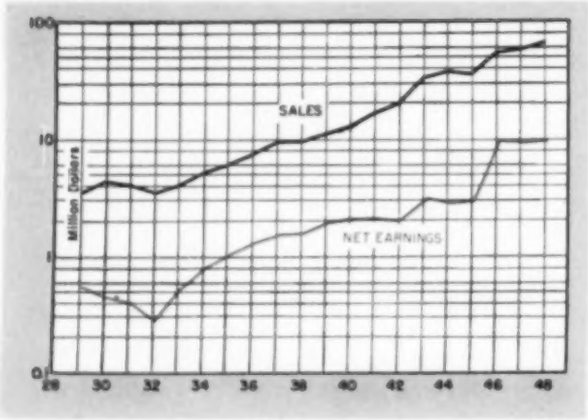
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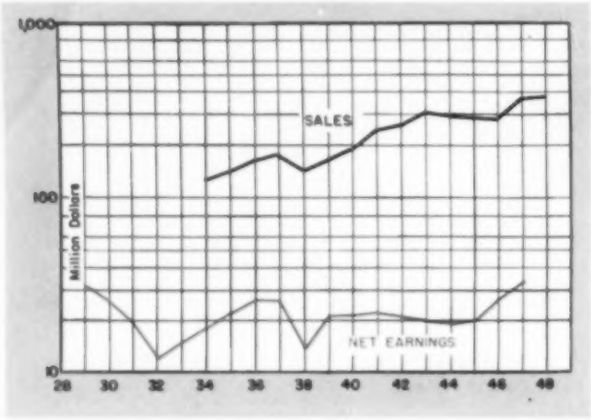
PROCESS INDUST

The information shown here, while not guaranteed, has been taken from reliable sources. I
N. A. means not available. N. C. means not comparable. 1948 sales and net i
are for calendar years except for those marked with an asterisk (*). All fig

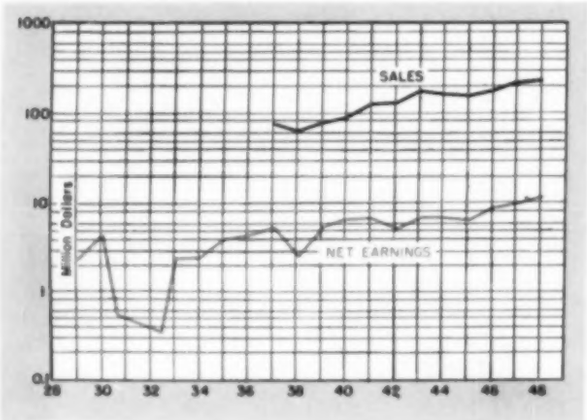
ABBOTT LABORATORIES



ALLIED CHEMICAL & DYE CORP.

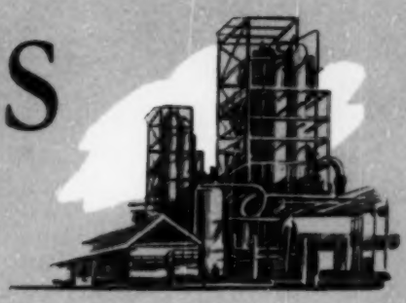


AMERICAN CYANAMID CO.



Year	Total Assets	Working Capital	Current Assets	Current Liabilities	Sales	Net Income	Earned Per Share
ABBOTT LABORATORIES							
1939	16,084	10,599	12,146	1,547	11,485	2,048	1.30
1943	31,538	12,454	24,143	11,689	33,265	3,285	2.09
1945	36,906	19,549	29,250	9,701	37,930	3,157	1.78
1946	53,865	30,062	43,633	13,571	54,210	10,821	5.79
1947	58,251	30,988	44,106	13,118	59,621	10,216	5.46
ALLIED CHEMICAL & DYE CORP.							
1939	236,698	95,610	108,063	12,453	167,993	21,042	9.50
1943	288,680	122,513	158,863	36,350	303,757	19,023	8.59
1945	285,893	161,480	187,913	26,433	286,742	18,914	8.54
1946	301,370	149,950	181,242	31,292	280,484	26,707	12.06
1947	330,808	138,347	178,890	40,543	365,943	30,311	13.69
ALLIED LABORATORIES, INC.							
1939	2,946	1,029	1,441	412	2,872	388	1.73
1943	4,831	2,215	3,132	917	6,037	393	1.57
1945	5,730	2,432	3,725	1,293	6,568	358	1.43
1946	6,176	2,838	3,862	1,024	7,746	623	2.50
1947	8,751	4,466	5,934	1,468	10,223	1,114	4.26
AMERICAN CYANAMID CO.							
1939	77,346	30,405	39,445	9,040	76,574	5,525	2.07
1943	152,294	54,273	101,350	47,077	175,992	6,653	2.25
1945	145,263	71,904	94,137	22,233	159,053	6,213	2.02
1946	162,121	55,235	87,056	31,821	178,953	8,693	2.90
1947	206,619	67,630	101,860	34,230	214,581	9,156	2.96
BRISTOL-MYERS CO.							
1939	8,958	5,241	6,416	1,175	16,041	2,380	1.74
1943	18,312	6,961	13,377	6,416	28,690	2,684	2.01
1945	29,035	14,849	21,360	6,511	37,136	2,498	1.71
1946	33,256	14,355	21,441	7,086	47,828	7,046	4.90
1947	33,288	11,072	17,393	6,321	44,655	3,943	2.66
CELANESE CORP. OF AMERICA							
1999	66,297	20,964	26,658	5,694	35,479	6,374	1.41
1943	107,015	38,539	43,787	5,248	94,585	6,276	1.13
1945	137,305	59,736	65,355	5,619	104,197	7,613	1.13
1946	191,945	84,763	93,069	8,306	135,202	16,059	2.36
1947	211,990	61,617	80,033	18,416	181,084	24,173	3.83
COLGATE-PALMOLIVE-PEET CO.							
1939	68,942	32,688	42,152	9,464	91,563	6,495	2.67
1943	71,150	40,709	46,755	6,046	114,028	6,617	3.10
1945	76,404	47,116	53,842	6,726	135,368	7,036	3.34
1946	86,056	47,513	57,262	9,749	146,372	14,444	7.14
1947	102,726	53,635	68,503	14,868	259,396	19,014	9.30
COMMERCIAL SOLVENTS CORP.							
1939	20,042	11,317	13,865	2,548	14,480	1,600	0.60
1943	N.A.	15,773	N.A.	N.A.	39,215	2,899	N.A.
1945	26,669	18,901	21,167	2,266	40,284	2,033	.77
1946	31,573	14,709	18,938	4,229	41,874	5,719	2.17
1947	37,554	15,204	20,468	5,264	54,915	9,068	3.44
CONTINENTAL OIL CO.							
1939	127,662	38,844	47,922	9,078	81,111	6,305	1.35
1943	148,974	32,727	51,866	19,139	119,488	14,081	3.01
1945	173,241	21,368	54,751	33,383	144,164	15,143	3.23
1946	178,183	30,935	58,929	27,994	159,231	19,014	4.05
1947	209,224	39,112	76,039	36,927	228,731	31,357	6.61
CORN PRODUCTS REFINING CO.							
1939	115,935	33,794	41,952	8,158	56,156	10,120	3.32
1943	123,542	43,996	66,282	22,286	118,211	8,701	2.76
1945	119,379	46,922	64,453	17,531	106,477	8,633	2.73
1946	131,152	48,399	72,041	23,642	131,897	13,624	4.71
1947	145,622	44,795	74,841	30,046	196,767	15,238	5.35
CORNING GLASS WORKS							
1939	N.A.	N.A.	N.A.	N.A.	20,041	2,638	0.96
1943	N.A.	N.A.	N.A.	N.A.	51,000	2,594	0.97
1945	35,797	14,142	19,825	5,683	48,202	2,385	0.86
1946	37,922	11,303	18,802	7,499	55,852	2,801	1.00
1947	43,761	13,263	20,278	7,015	61,296	2,218	.73

USTRY FINANCES



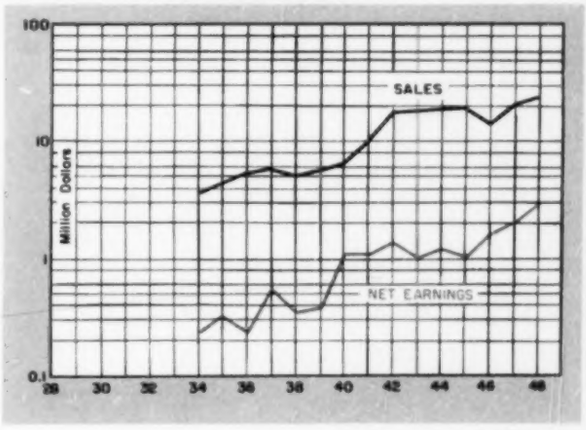
ble sources. In its preparation the editors have had the cooperation of Chemical Fund, Inc.
ales and net income figures charted are in part estimates. All figures shown
k (*). All figures except "Earned Per Share" are expressed in thousands.

Year	Total Assets	Working Capital	Current Assets	Current Liabilities	Sales	Net Income	Earned Per Share
THE MATHIESON ALKALI WORKS, INC.							
1939	24,857	3,736	4,520	784	10,967	1,095	1.12
1943	27,461	7,207	9,789	2,582	18,206	1,273	1.34
1945	28,076	10,329	12,636	2,307	19,590	1,148	1.19
1946	28,890	7,723	10,065	2,342	20,523	2,032	2.25
1947	37,060	437	9,381	8,944	24,630	2,930	3.34
MEAD JOHNSON & CO.							
1939	8,683	3,990	4,793	803	7,708	1,814	1.03
1943	14,543	5,091	9,200	4,109	17,297	2,062	1.18
1945	15,884	6,529	10,693	4,164	18,999	1,693	.95
1946	17,428	6,854	11,217	4,363	22,927	3,063	1.81
1947	19,879	6,832	12,723	5,891	26,616	2,530	1.49
MERCK & CO., INC.							
1939	12,230	6,164	8,202	2,038	20,061	1,857	1.75
1943	37,515	11,406	22,791	11,385	57,905	3,592	3.11
1945	36,352	12,963	21,833	8,870	55,602	2,379	1.89
1946	46,347	18,489	28,043	9,554	61,554	6,046	5.11
1947	51,687	22,778	31,037	8,259	68,303	6,273	5.32
MINNESOTA MINING & MANUFACTURING CO.							
1939	15,140	7,874	9,732	1,858	17,307	4,365	2.27
1943	35,677	13,718	26,243	12,525	47,200	4,022	2.09
1945	37,441	19,790	28,221	8,431	63,548	3,649	1.87
1946	47,394	22,117	33,410	11,293	75,170	9,921	5.08
1947	77,311	41,225	54,791	13,566	93,437	11,645	5.94
MONSANTO CHEMICAL CO.							
1939	54,752	14,808	20,776	5,968	42,983	5,429	1.34
1943	72,234	25,178	32,379	7,201	81,697	5,316	1.19
1945	79,504	36,761	43,902	7,141	95,339	5,318	1.16
1946	129,012	61,333	73,572	12,239	99,591	10,084	2.37
1947	153,112	38,774	60,211	21,437	143,403	15,561	3.59
OWENS-ILLINOIS GLASS CO.							
1939	87,337	24,951	32,133	7,182	82,025	8,435	3.17
1943	112,135	27,532	55,602	28,070	172,132	9,478	3.56
1945	122,750	41,727	73,888	32,161	168,671	8,794	3.30
1946	127,126	32,773	60,103	27,330	196,259	13,247	4.53
1947	162,086	28,921	60,272	31,350	231,310	13,959	4.58
PARKE, DAVIS & CO.							
1939	44,110	20,070	25,968	5,898	32,809	9,254	1.89
1943	57,441	22,376	37,366	14,990	49,641	8,225	1.68
1945	49,660	25,384	40,626	15,242	54,665	7,763	1.59
1946	60,790	29,185	49,545	20,360	66,208	13,337	2.73
1947	63,098	28,004	46,225	18,822	74,188	10,410	2.13
PENICK & FORD, LTD., INC.							
1939	11,812	5,471	6,343	872	13,118	1,456	1.97
1943	14,378	6,310	9,034	2,724	27,219	1,251	1.69
1945	15,230	7,405	10,540	3,135	28,481	1,355	1.83
1946	15,316	7,288	9,878	2,590	34,169	2,299	3.11
1947	17,118	8,046	11,407	3,361	45,442	3,338	4.52
PENNSYLVANIA SALT MANUFACTURING CO.*							
1939	16,707	6,955	7,875	920	9,572	1,294	1.73
1943	24,382	5,227	9,647	4,420	26,571	1,400	1.87
1945	24,783	7,809	11,907	4,098	26,210	1,441	1.92
1946	23,742	9,665	12,505	2,840	23,763	1,460	1.95
1947	27,315	7,966	13,013	5,047	29,220	2,679	3.57
CHAS. PFIZER & CO., INC.							
1939	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1943	17,719	5,990	11,365	5,375	16,746	1,784	1.19
1945	23,695	9,188	18,554	9,366	27,538	1,853	1.24
1946	33,783	10,997	23,598	12,601	43,658	10,619	7.17
1947	42,793	18,145	29,336	11,191	39,215	9,346	6.27
PHILLIPS PETROLEUM CO.							
1939	223,280	24,306	39,258	14,952	112,928	9,833	2.21
1943	281,218	24,495	60,154	35,659	157,611	14,168	2.88
1945	317,021	43,310	72,604	29,294	212,458	22,571	4.59
1946	332,059	44,551	77,514	32,963	220,075	22,625	4.60
1947	439,289	64,207	116,233	52,026	298,310	40,894	8.11

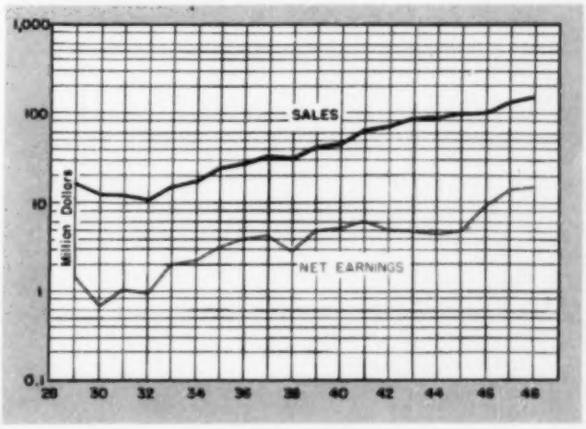
HEYDEN CHEMICAL CORP.



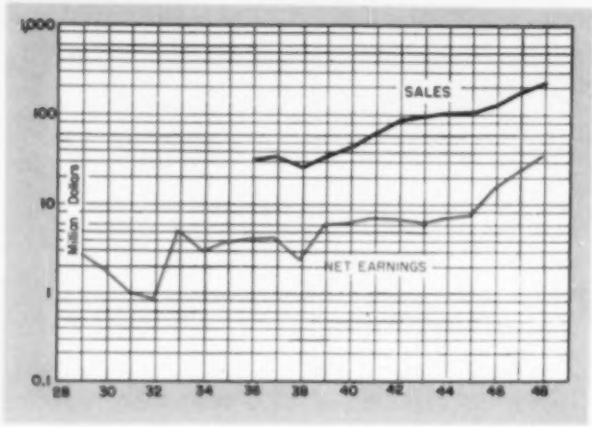
HOOKER ELECTROCHEMICAL CO.



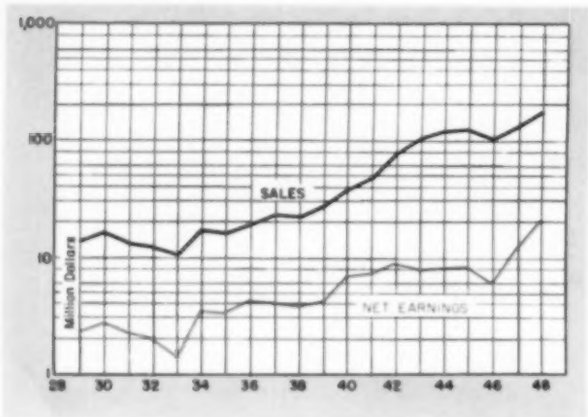
MONSANTO CHEMICAL CO.



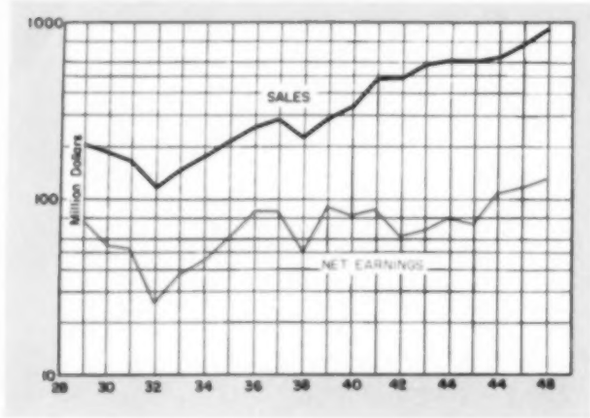
CELANESE CORP. OF AMERICA



THE DOW CHEMICAL CO.



E. I. Du PONT de NEMOURS & CO.



CREOLE PETROLEUM CORP.

1939	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
1943	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
1945	294,907	47,301	102,465	55,164	182,559	64,602	2.43
1946	348,587	44,563	122,732	67,169	243,182	83,306	3.13
1947	444,124	29,956	125,078	95,122	378,614	130,750	5.06

THE DOW CHEMICAL CO.*

1939	41,855	11,668	14,319	2,651	26,762	4,178	3.94
1943	119,008	4,813	35,911	31,098	105,428	8,302	6.41
1945	146,147	40,598	68,710	28,112	124,570	8,739	6.02
1946	128,756	40,234	53,231	12,997	101,814	6,148	3.95
1947	213,638	33,097	59,876	26,779	130,427	12,730	2.30

E. I. Du PONT de NEMOURS & CO.

1939	735,823	162,201	209,343	47,142	288,100	93,200	7.66
1943	903,578	202,755	310,373	107,618	585,500	69,700	5.59
1945	921,593	284,845	347,430	62,585	611,300	77,500	6.29
1946	964,637	260,368	335,355	74,987	648,700	112,600	9.44
1947	1,090,793	326,415	412,822	86,407	783,405	120,000	9.88

EASTMAN KODAK CO.

1939	213,612	89,589	114,646	25,057	140,332	21,538	1.71
1943	301,333	102,429	195,179	92,750	269,044	22,270	1.77
1945	306,658	133,936	213,010	79,074	301,502	32,716	2.61
1946	317,119	114,876	189,614	74,738	274,703	35,691	2.85
1947	359,846	120,768	200,657	79,889	351,751	43,199	3.46

FREEPORT SULPHUR CO.

1939	23,220	11,001	13,074	2,073	9,042	2,201	2.76
1943	28,049	14,749	18,722	3,973	16,555	2,483	3.10
1945	32,158	18,130	23,719	5,589	20,940	3,350	4.19
1946	33,956	23,440	28,163	4,723	19,945	3,753	4.69
1947	35,572	21,937	26,895	4,958	20,184	3,111	3.89

HERCULES POWDER CO.

1939	49,108	18,701	21,691	2,990	41,010	5,325	1.82
1943	96,505	27,950	58,675	30,725	122,519	5,705	1.97
1945	71,959	34,848	50,303	15,455	100,556	4,926	1.68
1946	70,513	29,747	42,467	12,720	100,728	8,410	3.03
1947	80,704	30,257	45,239	14,982	131,270	12,934	4.75

HEYDEN CHEMICAL CORP.

1939	5,555	456	1,282	826	5,212	773	.57
1943	10,588	2,964	4,571	1,607	14,212	1,100	.87
1945	15,803	5,147	8,932	3,785	17,156	1,403	1.04
1946	23,108	5,046	8,024	2,978	18,858	2,417	1.81
1947	27,809	9,198	11,357	2,159	21,912	2,716	2.01

HOOKER ELECTROCHEMICAL CO.*

1939	9,908	1,800	2,390	590	5,673	396	.49
1943	12,150	2,440	5,386	2,946	17,579	1,070	1.71
1945	12,953	5,035	6,721	1,686	19,075	1,063	1.29
1946	13,769	4,120	5,814	1,694	14,885	1,694	2.21
1947	20,592	6,847	8,440	1,593	20,187	2,185	2.45

INTERNATIONAL MINERALS & CHEMICAL CORP.*

1939	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
1943	33,416	6,601	8,762	2,161	22,477	2,076	3.61
1945	37,050	11,906	13,380	1,474	30,301	2,038	2.76
1946	40,844	11,337	13,257	1,920	34,373	2,926	3.92
1947	47,089	11,344	13,954	2,610	41,302	3,827	4.35

INTERNATIONAL SALT CO.

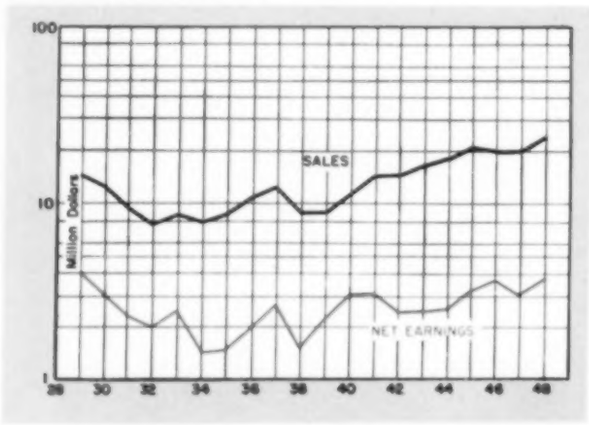
1939	13,500	2,670	2,965	295	7,095	462	1.92
1943	14,141	3,048	4,143	1,095	10,195	705	2.94
1945	15,066	2,614	5,426	2,812	11,682	678	2.82
1946	14,290	2,461	4,118	1,657	10,779	1,272	5.30
1947	15,268	2,623	4,679	2,056	13,121	1,625	6.77

LINDSAY LIGHT & CHEMICAL CO.

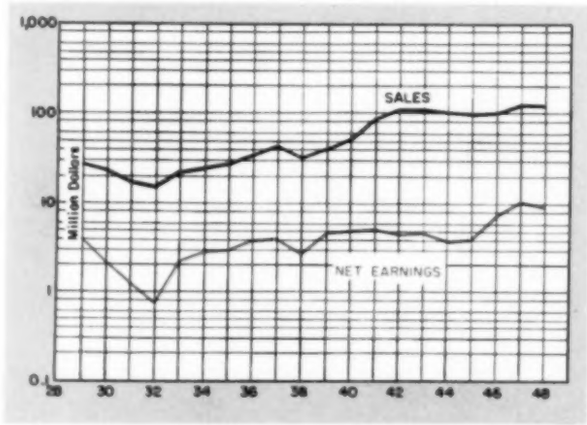
1939	1,059	160	239	79	522	69	.89
1943	736	192	457	265	1,497	78	1.01
1945	723	308	527	219	1,477	59	.70
1946	871	474	684	210	1,691	228	3.50
1947	1,262	727	1,081	354	N.A.	409	6.52

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FREEPORT SULPHUR CO.



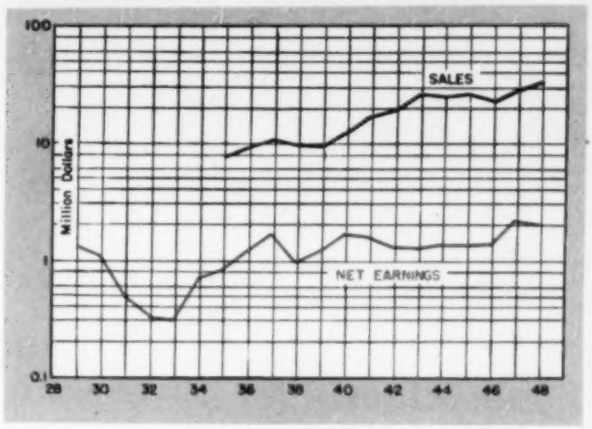
HERCULES POWDER CO.



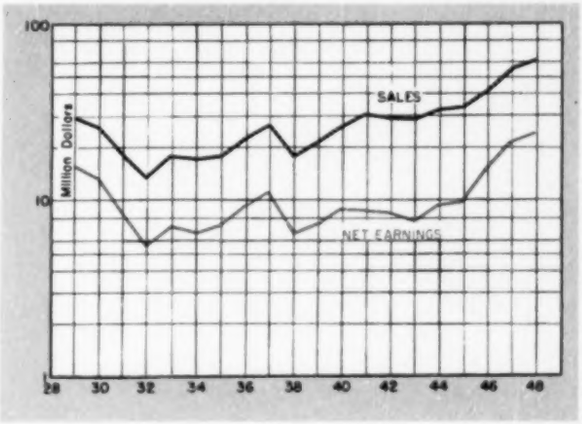


N.C.	**PITTSBURGH PLATE GLASS CO.**							
N.C.	1939	124,150	45,074	53,466	8,392	83,190	10,766	1.24
2.43	1943	146,208	52,603	71,830	19,227	119,383	13,390	1.51
3.13	1945	154,425	61,798	79,915	18,117	144,173	13,539	1.53
5.06	1946	174,003	54,055	83,756	29,701	184,661	17,061	1.92
	1947	206,671	57,278	101,737	44,459	262,529	27,771	3.11
	THE PROCTER & GAMBLE CO.*							
3.94	1939	150,821	71,662	89,528	17,866	211,016	25,400	3.79
6.41	1943	173,003	89,002	103,211	14,209	302,154	20,677	3.13
6.02	1945	173,939	92,521	108,196	15,675	342,512	19,512	2.95
3.95	1946	179,690	94,928	108,020	13,092	309,834	21,264	3.29
2.30	1947	242,263	114,662	146,864	32,203	533,911	32,924	5.11
	SHELL UNION OIL CORP.							
7.66	1939	401,048	87,762	117,737	29,975	248,402	11,806	0.76
5.59	1943	461,378	90,151	191,620	101,469	407,737	24,543	1.82
6.29	1945	426,917	146,416	207,447	61,030	475,911	28,712	2.13
9.44	1946	470,979	179,580	244,043	64,463	442,828	32,880	2.44
9.88	1947	533,912	114,674	218,712	104,038	628,105	59,875	4.44
	E. R. SQUIBB & SONS*							
1.71	1939	19,965	8,539	11,147	2,608	19,794	2,061	1.23
1.77	1943	33,947	16,702	25,229	8,526	42,432	2,455	1.60
2.61	1945	40,878	19,311	30,849	11,538	53,553	2,513	1.37
2.85	1946	51,117	23,990	37,038	13,048	59,836	5,151	3.01
3.46	1947	60,849	31,439	43,873	12,434	68,219	5,525	3.26
	STANDARD OIL CO. (N. J.)							
2.76	1939	2,034,000	466,000	595,000	129,000	933,000	89,000	3.27
3.10	1943	2,327,000	585,000	859,000	273,000	1,302,000	123,000	4.45
4.19	1945	2,531,000	779,000	1,043,000	264,000	1,618,000	154,000	5.64
4.69	1946	2,659,000	739,000	1,023,000	284,000	1,622,000	177,000	6.50
3.89	1947	2,995,000	690,000	1,100,000	410,000	2,354,000	268,000	9.83
	STERLING DRUG, INC.							
1.82	1939	51,964	17,224	24,720	7,496	38,985	9,140	2.63
1.97	1943	55,967	19,371	32,569	13,198	59,394	7,806	2.23
1.68	1945	85,070	33,820	53,660	19,841	104,585	9,970	2.60
3.03	1946	96,513	31,985	55,212	23,227	121,488	13,939	3.59
4.75	1947	99,833	32,668	57,663	24,995	130,655	12,059	3.09
	TEXAS GULF SULPHUR CO.							
.57	1939	61,916	28,411	30,521	2,110	21,288	7,847	2.04
.87	1943	66,865	31,647	39,576	7,929	28,893	7,966	2.07
1.04	1945	68,967	36,346	45,758	9,412	34,560	9,993	2.60
1.81	1946	71,545	42,128	50,045	7,917	40,158	15,239	3.97
2.01	1947	79,061	46,725	57,398	10,673	55,365	21,665	5.64
	UNION CARBIDE AND CARBON CORP.							
.49	1939	336,844	110,825	133,387	22,562	170,347	35,847	1.28
1.71	1943	459,457	132,624	248,127	115,503	488,351	38,342	1.38
1.29	1945	428,078	188,858	281,571	92,713	481,521	37,889	1.36
2.21	1946	439,013	176,599	256,899	80,300	414,988	57,206	2.03
2.45	1947	649,109	275,784	378,448	102,663	521,845	75,667	2.66
	UNITED STATES POTASH CO.							
N.C.	1939	5,650	2,004	2,469	465	3,972	1,433	1.25
3.61	1943	7,338	1,873	3,856	1,983	7,250	1,926	1.75
2.76	1945	7,627	2,488	3,476	988	8,039	1,645	1.49
3.92	1946	7,461	1,818	3,384	1,566	9,109	2,744	2.56
4.35	1947	8,943	2,635	4,429	1,795	10,329	2,933	2.79
	VICTOR CHEMICAL WORKS							
1.92	1939	8,715	2,843	3,687	844	8,394	1,104	1.59
2.94	1943	10,394	4,830	5,632	802	14,564	1,148	1.53
2.82	1945	11,861	6,429	7,589	1,160	16,548	1,128	1.51
5.30	1946	16,813	6,957	8,348	1,391	19,409	2,115	2.65
6.77	1947	21,833	7,068	8,992	1,924	21,302	2,044	2.47
	WESTVACO CHLORINE PRODUCTS DIV.							
.89	1939	13,180	3,265	3,924	659	10,803	1,275	1.94
1.01	1943	14,984	4,975	5,751	776	18,177	1,176	1.75
.70	1945	18,336	8,621	9,410	789	17,973	963	1.20
3.50	1946	19,595	6,890	8,362	4,026	17,784	1,109	1.41
6.52	1947	24,584	9,629	10,905	1,276	25,058	2,658	4.03

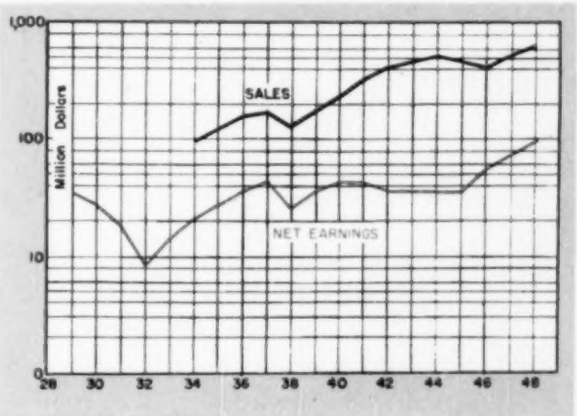
PENNSYLVANIA SALT MANUFACTURING CO.



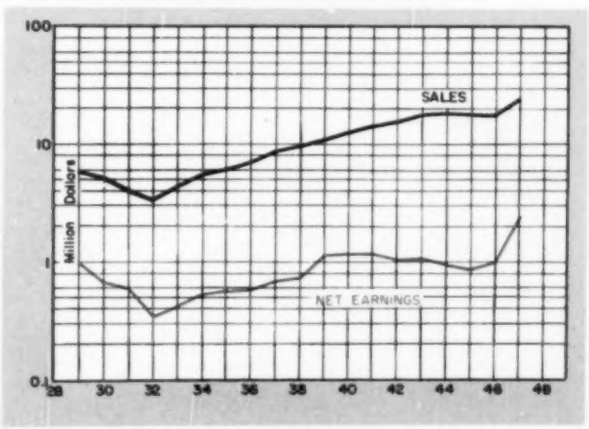
TEXAS GULF SULPHUR CO.



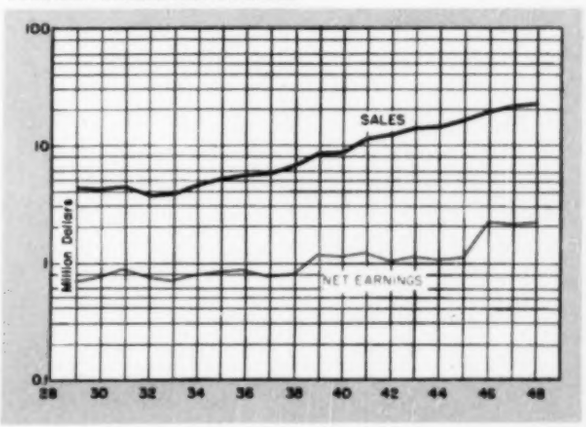
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WESTVACO CHLORINE PRODUCTS DIV.



VICTOR CHEMICAL WORKS





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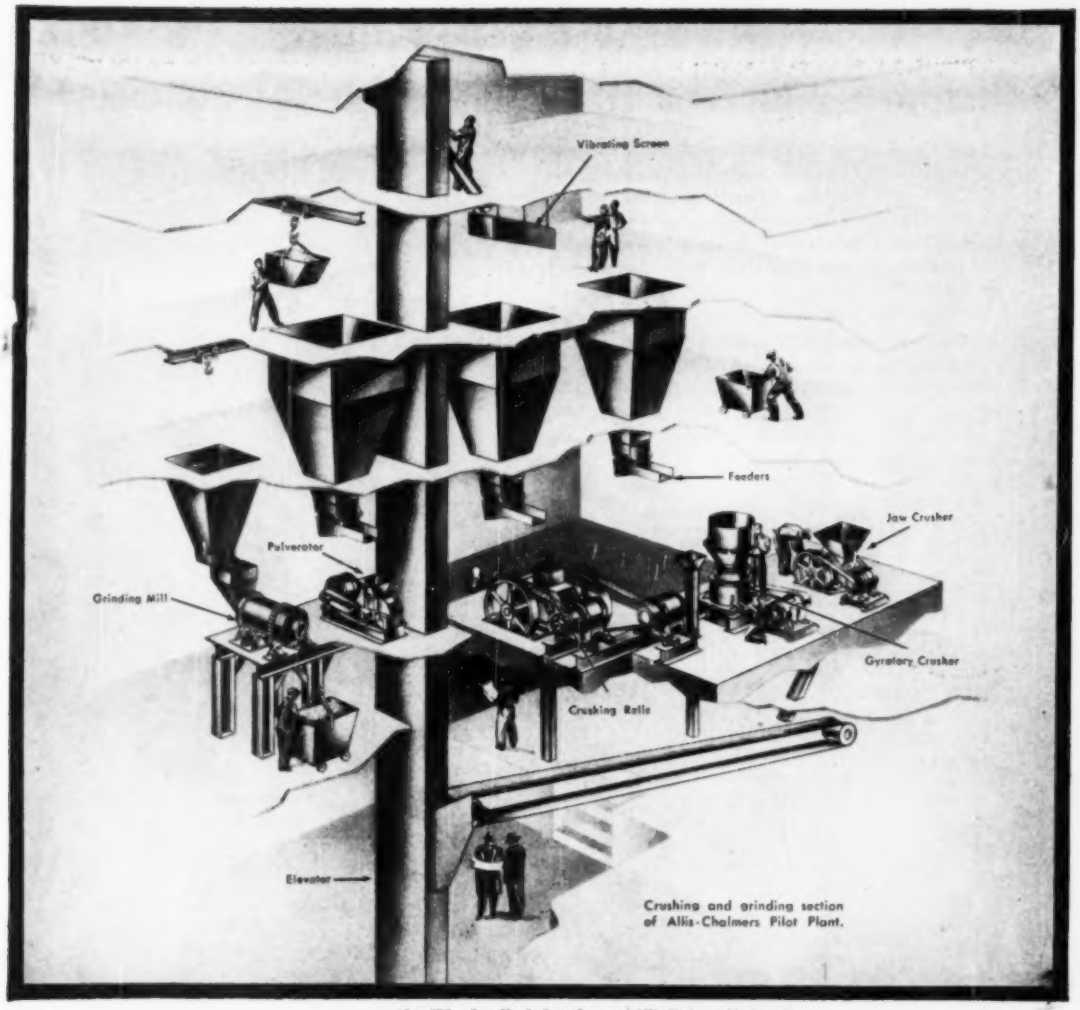
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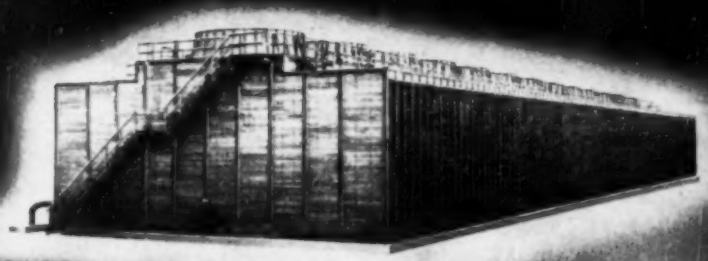
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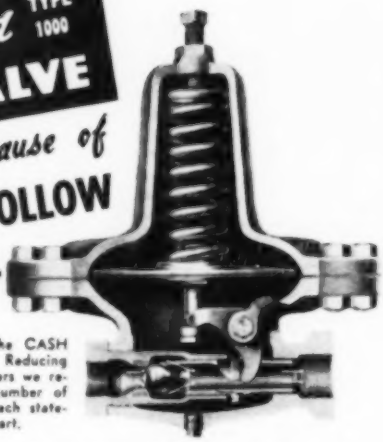
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CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

. . . . it's done because of

BENEFITS THAT FOLLOW INSTALLATION . . .



Below is shown 10 benefits obtainable with the CASH STANDARD Type "1000" Streamlined Pressure Reducing Valve. Statements from a few of the many letters we receive from users are listed. Each gives the number of benefits realized. Check the letter preceding each statement against the corresponding letters in the chart.

A A Maintenance Engineer checks 7 of the points and says, "We have experienced excellent results."

B A Tire Company in checking 10 points says, "We wouldn't hesitate a minute in recommending the '1000'."

C A Maintenance Engineer checks 10 of the points and says, "We use the '1000' under very adverse conditions and find it perfect in every way."

D A Mill Supply Company checks 6 of the points and says, "Said valves can be throttled to practically zero from pressure set at."

E A Manufacturer checks 7 of the points and says, "We have found the '1000' to be a very good pressure controller in every way."

F A Maintenance Engineer checks 8 of the points and says, "If we had more places to use Type '1000' I would insist on using them."

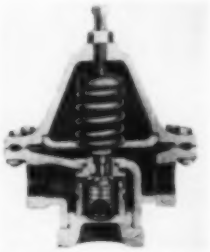
A B C D E	**POINT No. 1** Maximum capacity when needed most.
A B C D E F	**POINT No. 2** Accurate pressure control under toughest working conditions.
A B C E F	**POINT No. 3** Trouble-free service.
A B C D E F	**POINT No. 4** Smooth operation.
B C E F	**POINT No. 5** Tight closure.
B C D	**POINT No. 6** Speedier production results.
A B C E F	**POINT No. 7** Elimination of failures.
B C D F	**POINT No. 8** Cost-saving operation.
A B C F	**POINT No. 9** No spoilage.
A B C D E F	**POINT No. 10** Practically zero in maintenance.

CASH STANDARD CONTROLS . . VALVES

Send FOR BULLETIN 962

A. W. CASH COMPANY
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Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

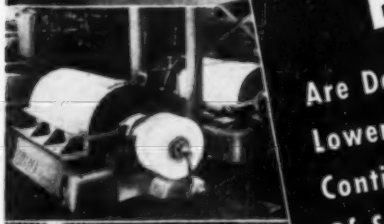


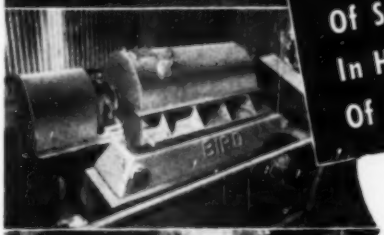
Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



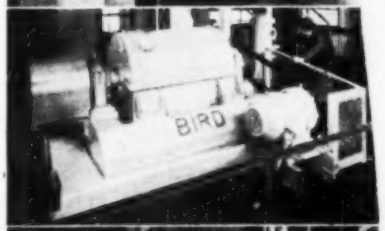
Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

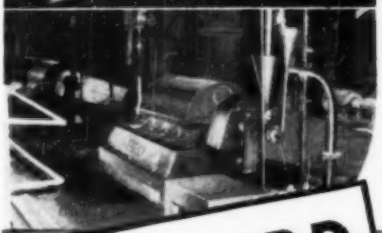












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Potato Starch
Salt from Glycerine
Sodium Bichromate
Sodium Carbonate
Sodium Chloride
Sodium Fluoride
Sodium Hydroxide
Sodium Nitrate
Sodium Stannate
Sodium Sulphate
Sodium Sulphite
Sodium Thiosulphate
Solvent Extractions
Soya Beans
Starch
Sulfur
Synthetic Resins
Tallow
Tankage
Tartaric Acid
Titanium Dioxide
Tri-Sodium Phosphate
Tungsten Salts
Ultramarine Pigment
Vinyl Resins
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and many others

THE BIRD CONTINUOUS CENTRIFUGAL FILTER

A BIG FACTOR IN COST REDUCTION



For Acids

A Companion to the Famous WILFLEY Sand Pump

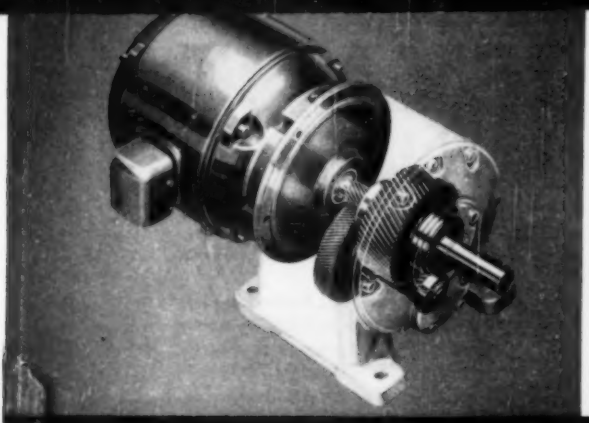
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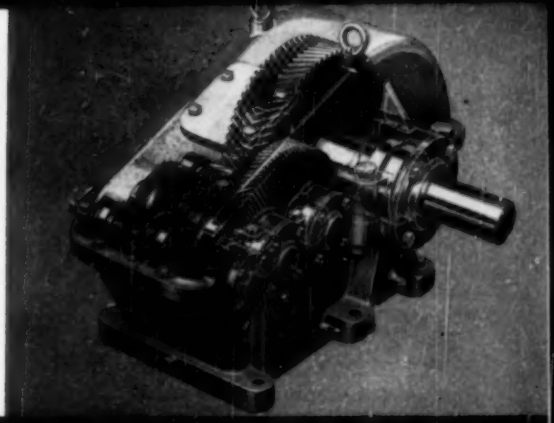
Buy WILFLEY for Cost Saving Performance

The striking efficiency of the WILFLEY Acid Pump—measured in terms of power saving and continuous, trouble-free handling of acids, corrosives, hot liquids and mild abrasives—is a big cost-reducing factor in most of the modern chemical plants of America. This is the acid pump that delivers full production on a 24-hour basis without attention. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Individual engineering on every application. Write or wire for information that will help reduce YOUR costs.

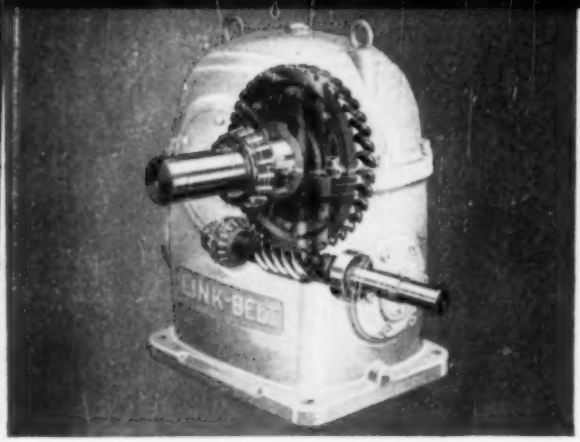
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New York Office: 1775 Broadway, New York City

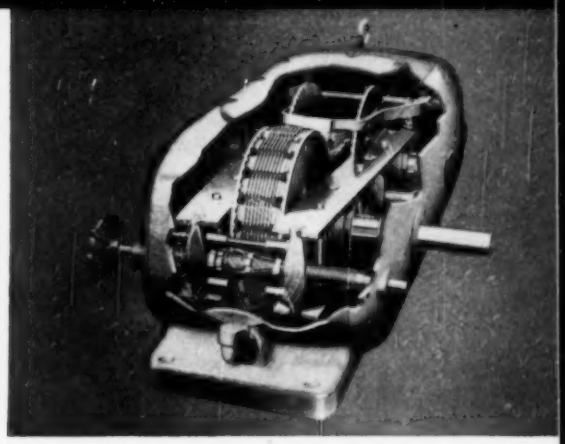
WILFLEY *Acid* PUMPS





is Speed Reduction Your Problem?





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Power at the required speed is available through the use of a Link-Belt enclosed gear drive. Regardless of your specific needs for ratio, power or speed, we have the correct answer, and our engineers will be pleased to assist you with your power transmission problems.

Gearmotors

Packaged Power Drives that are compact, economical and highly efficient are available with ratings from 1 to 30 horsepower and output speeds from 280 to 6 R.P.M. These easily-installed streamlined Gearmotors are completely explained in Book No. 1815, a copy of which is yours for the asking.

PIV Gear Speed Changers

In any process where precise speed is a factor in quality, costs, efficiency or profits, the PIV Gear is the ideal answer to your problem. Built with vertical or horizontal housing, plain or motorized, and with or without enclosed reduction gears. From ½ to 25 h.p. and ratios up to 6:1. Send for Book No. 1874-B.

Worm Gear Drives

For high reduction drive arrangements, these time-proved rugged drives are an ideal answer. Take your choice from a complete line of single, double or helical Worm Gear Drives having horizontal or vertical output shafts and satisfy exactly your requirements. We would be pleased to send Book No. 1824, which describes in detail our Worm Gear Drives.

Herringbone Gear Drives

Link-Belt's large selection of single, double and triple reduction Herringbone Gear Drives adequately fill the bill for small, moderate or large horsepower speed reduction requirements. A mighty good answer to your speed reduction problem. Can we send Book No. 1819 so you can see for yourself?

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LINK-BELT

Power Transmission Machinery
"THE COMPLETE LINE"

STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials



RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.



DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.



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MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

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*from Pittsburgh's "Isle of Chemicals"**

and more to come!



1 PIPE LINE ENAMEL PLANT

The new Pipe Line Enamel Plant where the company's own tar is converted into bituminous protective coatings of wide usefulness to industry and utilities.



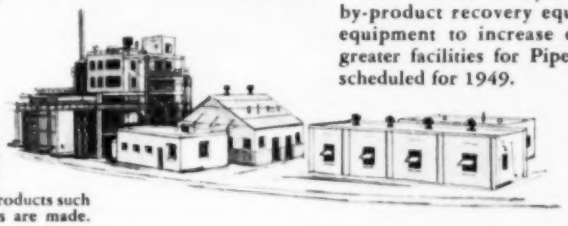
2 AGRICULTURAL CHEMICAL PLANT

The new Agricultural Chemical Plant manufactures a variety of chemicals for weed control, insect and pest control, plant growth regulation and similar agricultural applications.



3 PHTHALIC ANHYDRIDE PLANT

In full operation, this new Plant takes Naphthalene from the by-product coke ovens and converts it into Phthalic Anhydride from which many products such as resins and plasticizers are made.



The policy of constantly expanding the facilities of Pittsburgh Coke & Chemical Company—for producing a greater variety of "finished" chemicals—moved closer to its goal in 1948. The program, in 1949, will continue unabated.

To the *Pittsburgh* line of coal-chemicals, these recently completed operating units have added bituminous protective coatings, such as Pipe Line Enamels for the protection of gas and oil transmission lines; a wide range of Agricultural Chemicals such as insecticides, herbicides, fungicides and rodenticides; and Phthalic Anhydride from which certain resins and plasticizers are made.

An additional battery of 35 new coke ovens, with by-product recovery equipment, new grinding equipment to increase cement production and greater facilities for Pipe Enamel production are scheduled for 1949.

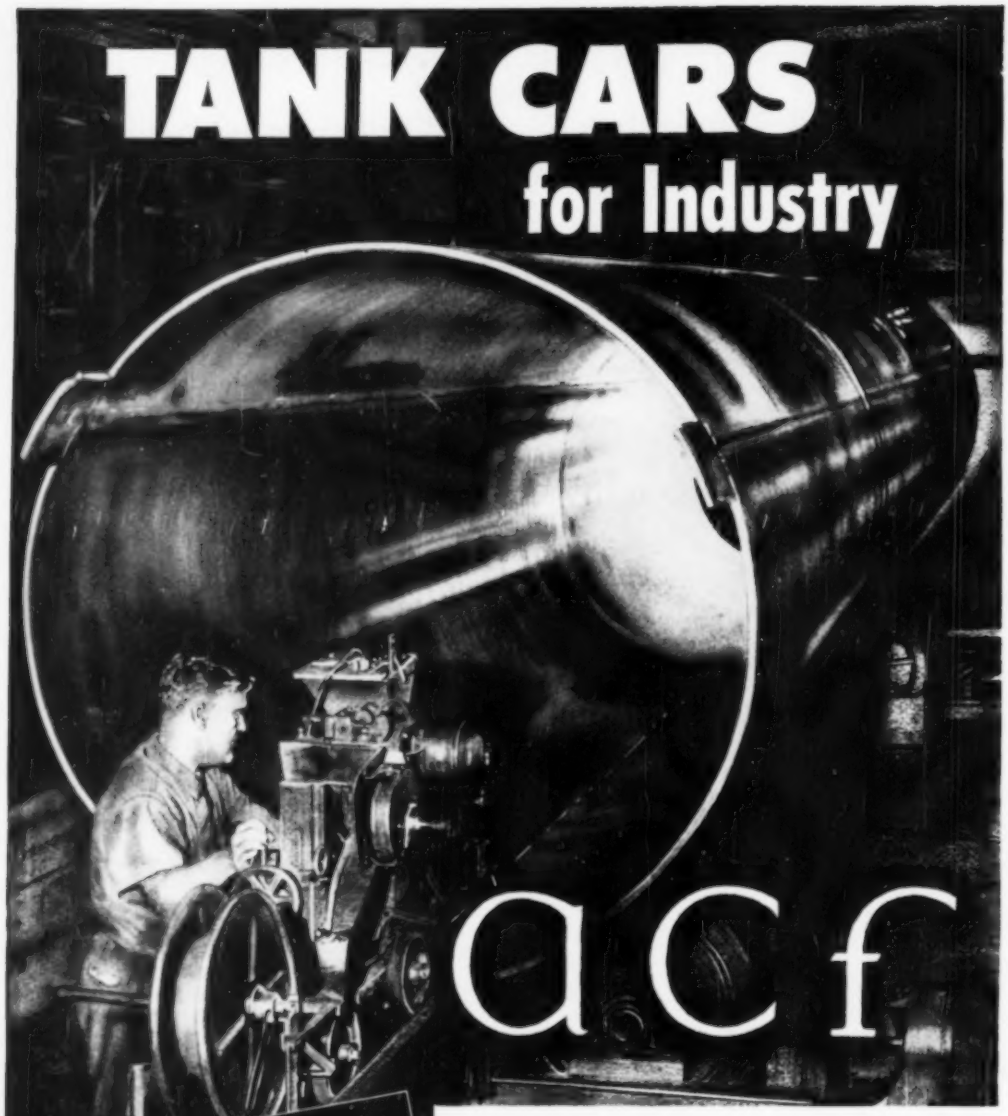
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Grant Building · Pittsburgh 19, Pennsylvania

PLANT: NEVILLE ISLAND*

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TANK CARS for Industry



American Car and Foundry Co.

"Quality and Vision in Railroad Transportation"

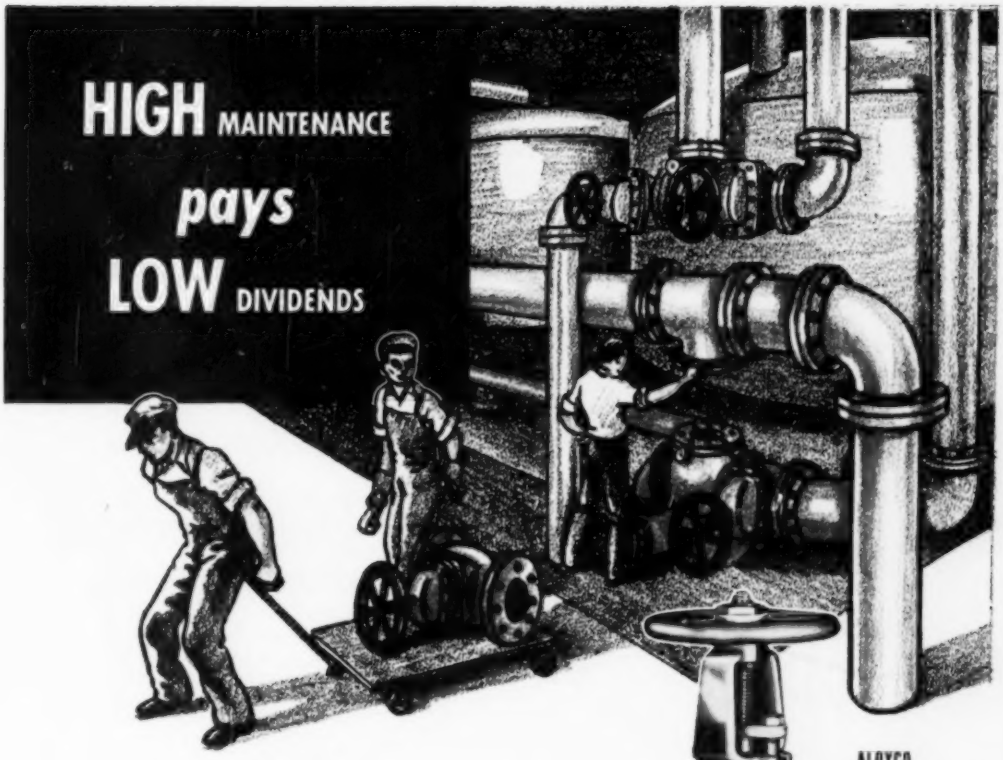
Recognition

comes only to those who cling to the highest manufacturing standards...who insist and prove that their products deliver the utmost in dependability and performance.

For more than 30 years, A.C.F. has been *recognized* as an outstanding builder of tank cars of all types. Today, when industry has need, A.C.F. springs to mind. It's both a good name and a good name to remember.

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save money with ALOYCO VALVES

● Few manufacturers can afford the luxury of frequent valve replacement. With labor and materials at present day peaks and when down-time is considered the cost of replacing a valve in a corrosive fluid pipe line is excessive.

It pays to install Aloyco Valves in the first place.

The benefit of Aloyco Corrosion Engineering experience is yours for the asking.

ALOYCO

STAINLESS STEEL VALVES AND FITTINGS

ALLOY STEEL PRODUCTS COMPANY, INC.



The Soap Lye Glycerine Process

. . . an example of Swenson Process Engineering

The Swenson-engineered system is extensively used by soap manufacturers to secure economical recovery of glycerine and salt from spent soap lye under conditions which assure a high degree of purity and recovery. Glycerine thus recovered is important for making explosives and for many pharmaceutical uses. The recovered salt is reused in the soap manufacturing process.

Swenson Process Engineering has brought improvements in the concentration of soap lye glycerine with the Forced Circulation Evaporator, as well as improvements in the attendant handling, filtering, washing, and recovery of the salt.

To overcome difficult evaporator operating problems due to salting and scale-forming characteristics of soap lye, Swenson engineers designed special Basket Type Evaporators and arrangements to permit long operating cycles between boil-outs.

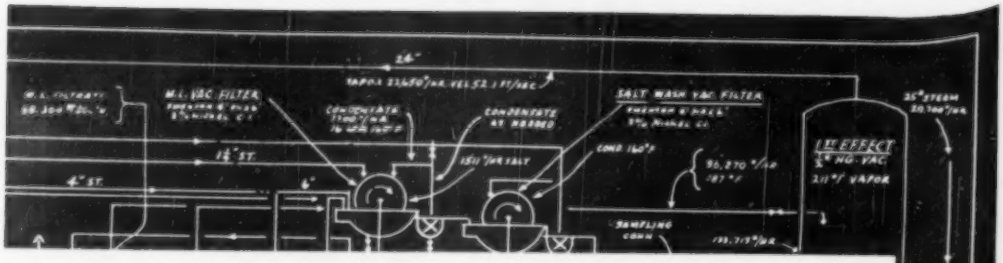
Swenson pioneered the use of the Rotary Vacuum Filter for handling salt . . . providing continuous low-cost filtration and high washing efficiency.

Swenson Process Engineering has increased the overall recovery of glycerine by reduced losses of glycerine through entrainment and in the salt washing and handling system.

SWENSON

EVAPORATORS • FILTERS • CRYSTALLIZERS

SPRAY DRYERS



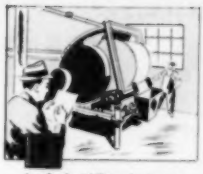
When plans are *first* discussed . . . it's time to consult Swenson

Swenson Process Engineering Service may prove invaluable to you in formulating plans for future product development or plant economies.

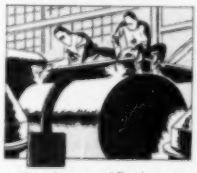
Because of their wide range of experience, Swenson engineers sometimes prevent costly mistakes, ofttimes find new applications for developments that have proved efficient in other processes . . . or develop new processes for special needs.

Only Swenson engineers can give you the advantages of Swenson's sixty years of experience in the process industries . . . the benefits of Swenson specialized research . . . and the cumulative engineering ability of the Swenson organization. Write us about your particular problems.

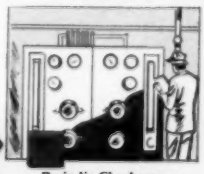
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Analysis of Requirements


Design and Layout


Manufacture of Equipment


Test Operation


Periodic Check-ups

Only SWENSON
PROVIDES THIS FIVE-WAY SERVICE

SHREDDING

THE PREPARATION OF MATERIAL

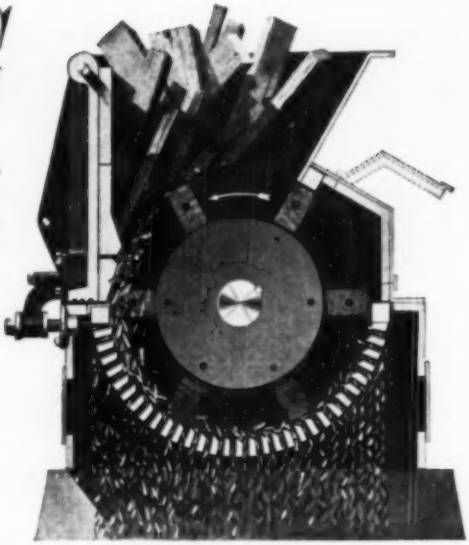
During Processing Operations
Reducing Waste Material for making a by-product
Salvage Purposes
Use as fuel

MANY INDUSTRIES SERVED BY JEFFREY SHREDDERS

Pulp and Paper Mills
Sugar Refineries
Extract Plants
Chemical Plants
Turpentine and Rosin Plants
Citrus Fruit Plants—Canneries
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Bagasse	Screenings	Materials	Shavings
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Knots	Straw	Chemicals	Cornstalks
Slivers	Wood	Plastic	Rubber

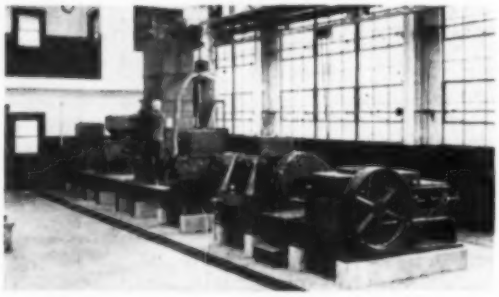


TYPE B HAMMER HOG (above)

Ideally suited for the reduction of wood refuse containing nails, spikes. No sharp edged knives to require frequent sharpening—no damage to working parts. This and other types shown and described in Catalog No. 805.

HIGH CAPACITY UNIFORM REDUCTION

Jeffrey Shredders are well built and properly designed — in various types for handling the different classes of material — a wide range of sizes — some with metal catchers — to suit capacity requirements.



Our modern test laboratory (left) enables us to determine the proper type and size of machine best suited to the need in advance of expenditure or installation. Sample of material may be furnished, if desired, with results kept in strict confidence.

●

PULVERIZERS ● SINGLE ROLL CRUSHERS
DOUBLE ROLL CRUSHERS
FLEXTOOTH CRUSHERS
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Complete Line of Material Handling, Processing and Mining Equipment

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U.S.I. CHEMICAL NEWS

February ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1949

Ethyl Ether Continues To Find Widespread Use

Ethyl ether, a versatile compound with many different solvent and chemical applications, continues to find widespread use in a number of industries. While it is not itself a solvent for nitrocellulose, ethyl ether becomes a solvent when used in combination with ethanol. This fact leads to its use for the manufacture of a variety of products derived from nitrocellulose, such as smokeless powder and other explosives; collodions—for medicinal and pharmaceutical use, for photographic work, and for duplicating stencils; and nitrocellulose plastics. Ethyl ether is important as a solvent for fats, oils, waxes, gums, and resins, and as a denaturant in several formulas of specially denatured alcohol. It is used also in the synthesis of organic chemicals, and in the purification of chemicals by extraction and crystallization. U. S. Industrial Chemicals, Inc., long a specialist in the manufacture of ethyl ether U.S.P., produces this important chemical from ethanol of high quality, under rigidly maintained standards of purity.

New Plastic Compound Is Self-Budgeting Fertilizer

A "self-budgeting" fertilizer, said to supply nitrogen to plants at a predetermined rate over long periods of time, is now being tested. The new synthetic is described as containing urea and formaldehyde. The nitrogen content, reported to be in a much less soluble form than it is in present nitrogen fertilizers, is said to range from 36 to 38 per cent. Changing the ratio of the reactants reportedly changes the solubility of the product, and consequently the rate of nitrogen release. Tests conducted recently indicate that the new material has good physical properties and does not lose nitrogen by leaching.

Ultrasensitive Emulsion Records Nuclear Particles

A new photographic emulsion for recording nuclear particles is said to be so sensitive that its producers are faced with the problem of how to prevent its premature exposure by cosmic rays during shipment to research workers. The new emulsion reportedly has recorded electron tracks ten times longer than those previously captured photographically. Said to come very close to complete recording of any nuclear particle, the emulsion is expected to bring new precision to autoradiography in medical research.

New Foam Inhibitor

A new product has been developed for suppressing the formation of foam in aqueous systems, according to a patent published recently. The foam inhibiting composition is reported to contain di-tertiary-amylphenoxyethanol, 2-methyl-2,4-pentanediol, and sodium petroleum sulfonate.

U.S.I. Distribution System Is Extensive—Assures Fast Customer Service

Closely Linked Production and Distribution Centers Throughout Country Fill Customer Orders Promptly

Few, if any, of the countless users of the chemical industry's diverse line of products ever give much thought to the unseen drama of distribution which is a vital factor in helping to solve today's complex production problems. Yet upon the efficiency of this unobtrusive behind-the-scenes service depends, very directly, the efficiency of the production mechanism of these users.

U. S. Industrial Chemicals, Inc., with plants and distribution centers located strategically throughout the country and linked by a comprehensive teletype hook-up, is in a position to render this distribution service unusually fast and well. Maintaining a fully manned distribution staff, whose full time job it is to cater to customer convenience, the company is able to supply all its customers, wherever they are located, with the right product when they want it. In barges, in railroad tank cars and box cars, and in trucks, U.S.I. products are shipped thousands of miles to warehouses located at many key points—to make these products rapidly available to meet local consumer demand.



Not a new skyscraper . . . but an artist's conception of how just the gallon cans of anti-freeze (not to mention drums or quart cans) turned out by U.S.I. in one year—would dwarf the Empire State Building if they were stacked in one pile with 2500 cans in every layer.

Plants and Distribution Centers

Sensing the growing importance of industrial production in the central and western areas of the United States, U.S.I. estab-

MORE

Ethyl Alcohol Treats Asthma in Children

Children suffering from asthma have been successfully treated by administration of ethyl alcohol intravenously, according to a recent report by two university physicians. Their report is said to be the first description of the use of this therapy in children, although it has received some trial in adults, the physicians observe.

According to the report, the patients—aged two, eight and a half, and ten—had not been benefited by previous therapy with subcutaneous adrenalin. On the day following alcohol treatment, however, their chests were described as much less congested than is usually found following therapy with adrenalin. The children given the alcohol treatment were able to expectorate some of the thick, stringy mucus, the report continues.

The physicians indicate that alcohol can be given to children in relatively larger quantities than to adults, without danger. Only with higher concentrations (10 to 30 per cent of alcohol) do complications such as hemolysis, shock, and decreased urinary output occur, it is reported.

New U.S.I. Resins Meet Government Specifications

Keeping abreast of recent active buying of paint materials by the government, U.S.I. has developed a number of new resins, each designed for use in particular specifications. New developments include resins for Federal Spec. TT-E-489 – Enamel, Gloss, Synthetic; TT-E-485b – Enamel, Rust Inhibitive; Navy Spec. 52-E-13 – Enamel, Semi-Gloss, Rapid Drying. There also has been some activity on Army Specs. 3-173 and 3-175, and for both of these there is a U.S.I. resin which will do the job.

New Pyrazolone Pigment

A new pyrazolone pigment, said to be golden brown and to have excellent light-fastness, is described in a recent patent. Ethyl acetoacetate, one of U.S.I.'s many products for the dye industry, is an important intermediate in producing pyrazolone dyes.

ADVERTISEMENT—*This entire page is a paid advertisement* *Printed in U.S.A.*

February ★ **U.S.I. CHEMICAL NEWS** ★ 1949

New Cellulose Product Is Flame-Retardant

A process for preparing a flame resistant cellulose product, claimed to be capable of withstanding repeated wetting with water without substantial loss of its flame-retardant properties, is outlined in a recent patent. The method is said to involve treating the cellulose with an aqueous solution of sodium tungstate, and then with a dilute acid solution of a formaldehyde resin. A water insoluble complex of tungsten with the resin is thereby formed and fixed to the cellulose without curing, the patent asserts.

CONTINUED Distribution Is Extensive

lished a number of years ago a manufacturing, storage, and distribution center in Chicago which currently ships out almost 150,000,000 pounds of alcohols, resins, and chemicals every year. To stock this center, U.S.I. products are shipped all the way from Baltimore, Bayonne, Newark, Pensacola, and New Orleans. On the West Coast, the U.S.I. plant at Anaheim, California, doubles as production center and bulk storage point for additional U.S.I. products coming in from the New Orleans and Baltimore plants. The New Orleans plant, producing alcohol, chemicals, and by-products, is a source of supply of U.S.I. products for the Southern and Southwestern States.

Hub of the chemical manufacturing and distribution facilities is the Baltimore plant, serving the entire nation with its varied chemical output—ranging from alcohols to acetoacet-ortho toluidide. The East Coast is served not only with the output of the Baltimore plant, but also with that of U.S.I.'s installation at Newark, N. J. Plants in Pensacola (resins) and Bayonne, N. J. (insecticides and essential oils), distribute their output locally and also ship to outlying distribution points.

U.S.I. has spared no expense to provide equipment equal to the difficult task of coordinating this nationwide distribution network. The pumping facilities alone in the deep-water plants have a capacity which would be adequate to handle the entire water supply of many of our larger cities. The type of barge used by U.S.I. on the inland waterways has the carrying capacity of a 45 tank car train.

The distribution of just one particular product, Super Pyro Anti-Freeze, is an interesting story in itself. Here U.S.I. has the difficult problem of timing the manufacture of millions of gallons of the anti-freeze, procuring and handling containers, and distributing the packaged product to thousands of distributors and dealers — all in a matter of a few months.

Additional Distribution Facilities

Supplementing the main "distribution points" (such as Chicago, which handles quantity orders — tank car, tank wagon, carload, and truckload shipments), the company maintains an extensive network of "warehouse points." Here U.S.I. products are stocked for quick service in small lots to large and small buyers.

With this nationwide network of plants, distribution centers, and warehouse points, backed by its experienced distribution staff, U.S.I. is in a position to serve its customers promptly, efficiently, and courteously.

Methionine Price Drop Helps Feed Industry

The recent lowering of methionine prices by U. S. Industrial Chemicals, Inc., is expected to increase the market demand for this product in the feed industry. The acceptance of methionine for use in human therapy by the pharmaceutical industry has been responsible for increased production and lower costs of this amino acid. Methionine, it is reported, has broader use applications than some of the other essential amino acids in that it is a strong methylating agent as well as an excellent detoxicant and a synergist for antioxidants.

Catalyst Gels Are Dried

A new process for preparing adsorbent gels from hydrogels by distilling as an azeotrope with butanol is described in a recent patent. The distillation is carried on, it is reported, until the particles no longer agglomerate, after which the butanol is removed from the dehydrated gel.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new quick-setting adhesive for hardwood and softwood, said to set in 10 minutes at room temperatures, has shown ultimate sheer strengths after 24 hours of 4,000 psi., the makers claim. **(No. 414)**

A new, quick-drying wet primer, said to give a hard paintable foundation for any type paint, is applicable over wet or dry, clean of rusted metal, including steel, aluminum and galvanizing, the manufacturers state. **(No. 415)**

Molecular distillation for semimicro analyses can be carried out on several samples simultaneously, it is reported, in a new high vacuum still. **(No. 416)**

A new metal-hard finish is recommended for either dip or spray application to all surfaces subjected to metal-to-metal abrasion. **(No. 417)**

A new liquid masking "tape," said to brush easily onto wood, glass, metal, and similar surfaces, reportedly dries in ten seconds and can be peeled off like tape when paint, lacquer, or other coating has dried. **(No. 418)**

For maintaining battery efficiency in cold weather, a new portable device can be stored in the glove compartment, it is reported. **(No. 419)**

A new special ink for permanent marking of anything laboratory men may wish to identify, is said to be non-fading, to dry instantly, and to be available in any color. **(No. 420)**

A new high speed temperature recorder, said to log as many as 160 separate thermocouple temperatures in succession at a rate of 4 seconds per point, operates an alarm when a preset temperature limit is reached, the makers state. **(No. 421)**

New replacements for carnauba wax in polishes for automobiles, wood, leather, etc., are said to be economical and when properly blended to give hardness, texture, and melting point equal to carnauba. **(No. 422)**

A new dripless, non-clogging valve for handling pulpy, viscous acid mixtures, can be installed in place of ordinary valves without alteration of equipment, the makers claim. **(No. 423)**

A new polystyrene composition for use in products exposed to fairly high temperatures, is said to withstand boiling water, and to have good color stability and low mold shrinkage. **(No. 424)**

U.S.I INDUSTRIAL CHEMICALS, INC.

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Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96% Absolute
*Super Pyro Anti-freeze
*Solox proprietary Solvent

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Butyl Acetate
Ethyl Acetate

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Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
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Diethyl Carbonate
Ethyl Chloroformate

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Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodiumoxalacetate

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Ethyl Ether
Ethyl Ether Absolute—A.C.S.

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*Curbay B-G *Special Liquid Curbay

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*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades

INSECTICIDE MATERIALS
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products

INSECTIFUGE MATERIALS
*Indalone
*Dimelone
Triple-Mix Repellents

OTHER PRODUCTS
Collodions Urethan, U.S.P.
Nitrocellulose Solutions DL-Methionine
Ethylene

Printed in U.S.A.



. . . maybe I should have used Stainless Steel, too!

FATHER TIME certainly took a beating from Stainless Steel equipment in 1948. And his prospects look even dimmer for the future. For, with more and more long-lasting Stainless Steel being used every day, corrosion, wear, thermal stresses and hard service are meeting their match—and Time's grim harvest of prematurely worn-out equipment is getting more meager yearly.

If your equipment must handle corrosive products, has to withstand excessive wear, is exposed to extremes of temperature and pressure, Stainless Steel —and especially U·S·S Stainless—will help you resist Time's relentless challenge.

So, start 1949 *right*. Plan to extend the life of your equipment by a more extensive use of Stainless. And to take full advantage of the many benefits this versatile steel has to offer, plan to use time-tested, *perfected* U·S·S Stainless Steel. Our engineers are specialists in its application. They will gladly show you how and where to use it to give you optimum results at minimum cost.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
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U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

9-192

UNITED STATES STEEL

ATLANTIC PETROLEUM CHEMICALS

ULTRAWET SK BEAD

Will this Ultrawet do your job best?



You are looking at a microphotograph of Atlantic Ultrawet SK bead. It contains a minimum of 35% active alkyl aryl sulfonate. This particular Ultrawet has many uses, including household detergents, cosmetics, industrial applications, dry mixing with alkalis and in the manufacture of scouring powder.

It has these advantages: whiteness, controlled density, lack of odor, uniformity. It is free-flowing and is shaped to go to work quickly.

Behind Ultrawet SK bead are Atlantic's research and production facilities, and more than 10 years' experience in producing quality surface-active agents.

APPLICATIONS	ULTRAWETS					
Form Minimum % Solids Minimum % Active-Solids	30E Liquid 30 85	30DS Liquid 30 85	35K Liquid 35 90	SK Bead 35	E Flake 80	K Flake 85
EMULSION BREAKING	✓					
LIGHT-DUTY HOUSEHOLD DETERGENTS				✓		
PENETRANT	✓	✓				
INDUSTRIAL DETERGENTS					✓	✓
HEAVY-DUTY HOUSEHOLD DETERGENTS						✓
EMULSIFIER					✓	✓
WETTING AGENT	✓	✓				
CHARGE STOCK FOR SPRAY AND DRUM DRYING			✓			
DRY MIXING WITH ALKALIS				✓	✓	✓
LIQUID HOUSEHOLD DETERGENTS		✓				
COUPLING AND SOLUBILIZING	✓					

For samples, further information and quotations, wire or write

THE ATLANTIC REFINING COMPANY

Chemical Products Division

260 South Broad Street, Philadelphia 1, Pa.
Chamber of Commerce Building, Pittsburgh 19, Pa.
Hospital Trust Building, Providence 1, R. I.
1112 South Boulevard Street, Charlotte 3, N. C.
111 West Washington Street, Chicago 2, Ill.

up to 45 tons per hour packed in thrifty multiwalls
—contents sealed in!

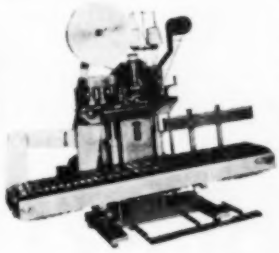
Sealed is the word for it! Your chemicals can't sift out of multiwalls that are closed with Bagpakers.® No moisture gets in or out, and the closures are uniformly strong . . . proof against rough handling or dropping.

If you already have efficient filling and weighing equipment, check the "DA" Bagpaker for applying the famous "cushion-stitch" *taped* closure. Or where you want completely automatic operation, get the facts on Model "A". Used with free or semi free-flowing materials, the Model "A" is your central packing point . . . saves labor and give away weights . . . cuts bag costs. Bagpakers handle from 25 to 45 tons per hour—consistently. Talk it over with a nearby Bagpak engineer, or write for proposal.

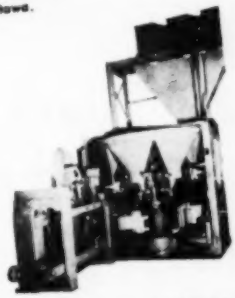
INTERNATIONAL PAPER COMPANY, Bagpak Division, 220 East 42nd St., New York 17

Branch Offices: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kans., Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, San Francisco.
In Canada: Continental Paper Products, Ltd., Montreal, Ottawa.





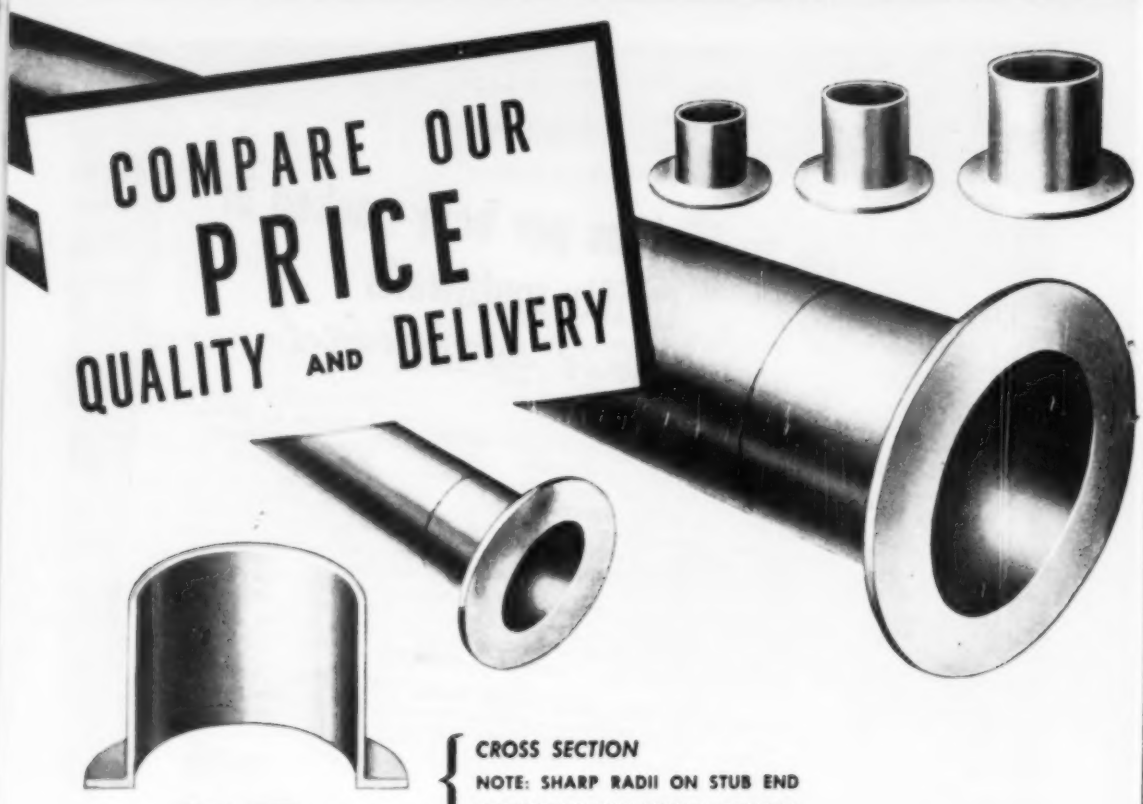
MODEL "DA" (portable)—One operator, filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to BAGPAKER conveyor (quickly adjustable for various bag sizes). Starting and stopping of sewing operation is automatic, no tape wasted.



MODEL "A"—Completely automatic —extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine capable of filling and closing 100-lb. bags at the rate of 15 per minute . . . needs one operator.

BAGPAK DIVISION

COMPARE OUR
PRICE
QUALITY AND DELIVERY



CROSS SECTION
NOTE: SHARP RADII ON STUB END
FORMED BY OUR SPECIAL PROCESS

All Types

STAINLESS STEEL

STUB ENDS-FITTINGS

AND VAN STONE FLANGES

ANY SIZE TO FIT YOUR REQUIREMENTS - SAMPLES ON REQUEST.

KELLEY
STAINLESS STEEL
Fabrication

O. G. KELLEY & CO.

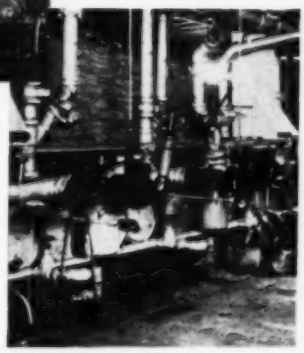
94 TAYLOR STREET, BOSTON 22, MASS.

NEW YORK N. Y. | JOHNSON CITY TENN. | ELIZABETH N. J.

Cleans every drop ...without stop



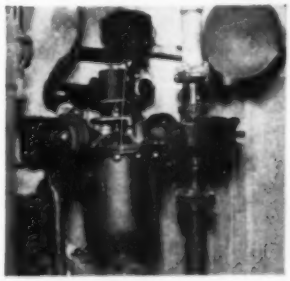
POSITIVE REMOVAL of solids and break-up of lumps in grease compounds by Cuno Auto-Klean Filter insures clean, lump-free grease delivered to customer. Auto-Klean handles 11,450 lb of grease per hour.



CONTINUITY OF OPERATION is one reason for selection of Cuno Auto-Klean to strain molasses. All-metal filter cartridge is cleaned—without stopping flow—by periodic turning of handle.



HIGH VISCOSITIES of 20,000 centipoises are handled easily by these Cuno Filters with stainless steel internals which remove unwanted solids from pyroxylin solution.



LOW PRESSURE DROP is extremely important in this application where Cuno Auto-Klean filters soap at 300 lb per minute. Continuous filter-cleaning is automatic, by motor drive.

CUNO

Fluid Conditioning

REMOVES MORE SIZES OF SOLIDS FROM MORE TYPES OF FLUIDS

Micronic • Disc-type • Wire-wound • Fabric Filters

Send Coupon

FOR FREE INFORMATION ON *CONTINUOUS CLEANING*

Cuno Engineering Corporation
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Please send information—without obligation—on Cuno continuous cleaning for application checked.

☐ Lubricating Oil	☐ Water	☐ Coatings and Finishes
☐ Hydraulic Oil	☐ Coolants	☐ Process Liquids
☐ Fuel Oil	☐ Industrial Fluids	☐ Food Products

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PLEASE ATTACH COUPON TO YOUR BUSINESS LETTERHEAD

TAKE A LOOK AT THIS LIST...

There's Something Here You Need

No matter what you make, there's at least one place in your plant or processes where Flintkote can serve you.

If you're looking for a new adhesive, check into Flintkote's wide line. We've bonded everything from silk to steel. You can buy any quantity... from a drum to a tank car. You can get a finished product . . . or one you can use as a component in your formulations. And if we don't have exactly what you need, our research staff will be glad to help develop it.

Perhaps you need a saturant, sizing or coating. Flintkote materials of this type have found use on many products... from paper bags to freight cars.

And if Plant Protection is one of your problems, Flintkote fills the bill again. For new construction or maintenance, Flintkote Protective Coatings, Mastic Flooring Emulsions, products for Waterproofing and Dampproofing are a few in a big family at your service.

So, take a look at this list. We're sure you'll find something there you need. If you want complete information and specifications on any Flintkote products, just write. We'll rush the facts to you.

THE FLINTKOTE COMPANY, *Industrial Products Division,*
30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.



ADHESIVES

Asphalt Emulsions—cold applied
Asphalt and Rubber Compounds
Solvent Rubber Cements
Synthetic Rubber and Resin Compounds
Rubber and Resin Water Dispersions
Asphalt Tile Cements



SATURANTS and SIZINGS

Asphalt Products for Waterproofing paper, cloth, building materials
Rubber Compounds for Carpet Backing and Impregnating
Binders for various compositions
Tire Cord Dipping Solutions



COATINGS

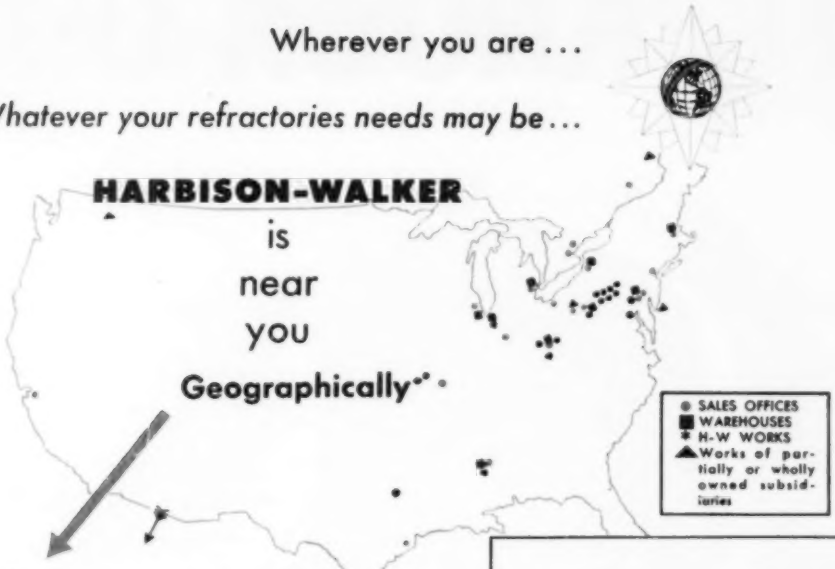
Products for Waterproofing and Dampproofing
Protection for Thermal Insulation
Corrosion Resistant Protection
Sound-Deadening—Spray-on
Anti-Slip Flooring
Joint and Crack Sealers—hot and cold applied
Plastic Compounds for Floors
Asphalt Base Aluminum Paint

FLINTKOTE *Products for Industry*

Wherever you are . . .

Whatever your refractories needs may be . . .

HARBISON-WALKER
is
near
you
Geographically



and equipped to serve you.

In all principal chemical producing areas, Harbison-Walker provides a complete service for users of refractories. Technical assistance may be obtained readily through our district representatives; the correct types and grades of refractory products for each application may be selected from the complete Harbison-Walker line; shipments are made from nearby Harbison-Walker plants or warehouses.

Among the various products made by Harbison-Walker are many especially designed for chemical plant service. Several of these are briefly mentioned as illustrations.

You are assured of greatest satisfaction by using Harbison-Walker refractories.

HARBISON-WALKER
PRODUCTS FOR
Chemical Plant Service

DURO acid-proof brick and tile for floors, pickling tanks, acid towers, stack linings and other service up to 2400°F. Dense, vitreous, non-absorbent.

ALAMO Super-duty fireclay brick for dutch ovens, combustion chambers and general high temperature service.

INSULATING brick of all classes for the entire range of operating temperatures.

OTHER PRODUCTS made by Harbison-Walker cover the entire field including all classes of basic, acid, alumina-silica and high alumina refractories, cements, plastics and castables.

TRADE MARK
REG. U.S. PAT. OFF.

Harbison-Walker Refractories Company
AND SUBSIDIARIES
WORLD'S LARGEST PRODUCER OF REFRACTORIES
General Offices . . . . . Pittsburgh 22, Pennsylvania

KNOCK-OUT





BULLETIN 2022 ▶

"Brown Flow Meters for Cost Accounting," is complete and informative. A copy will be sent to you upon request. Write today!

STEAM WASTE

with Brown

Flow Accounting Meters

Your costs for distribution and utilization of steam (or other fluid) will be known facts with the installation of Brown Flow Accounting Meters. Hourly and daily records from your Brown Flow Meters will enable you to know, not approximate, what is happening . . . where it is happening . . . when it is happening. You can deal a knock-out blow to waste and properly pro-rate expenses for each operation and each department. The Brown Flow Accounting System is producing sensational economies in many plants, repaying the original investment in a very short time.

Check, today, on the application of Brown Flow Accounting Meters to your processes! You can get detailed information in Bulletin 2022 . . . send for your copy!

Brown Recording Integrating Flow Meters are not expensive! For example, a complete unit for a six inch steam line costs less than $500.00!

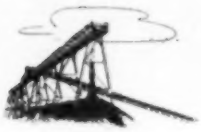
MINNEAPOLIS-HONEYWELL REGULATOR CO.
BROWN INSTRUMENTS DIVISION
4478 Wayne Ave., Philadelphia 44, Pa.
Offices in principal cities of the United States, Canada and throughout the world

BROWN *Advanced Instrumentation* FOR THE CHEMICAL INDUSTRY
Product of Honeywell



BELT CONVEYOR

BELT CONVEYOR
TRIPPER
•
BELT CONVEYOR
ON BOOM



SHUTTLE TYPE
BELT CONVEYOR

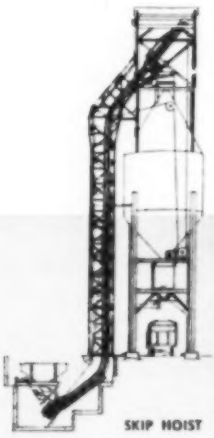
BELT CONVEYOR
STACKER
•
PORTABLE
BELT CONVEYOR

RUN AROUND
REDLER CONVEYOR
•



REDLER CONVEYOR ELEVATOR

HORIZONTAL
REDLER CONVEYOR
•



SKIP HOIST

Stephens-Adamson Has THE RIGHT COMBINATION of Conveyors for YOU

Now is the time to review your bulk material handling methods to check such points as these:

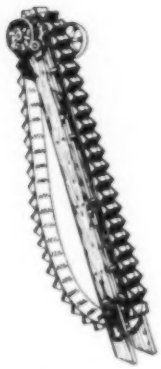
Are conveyors of right *capacity* for present volume? Right *type* for the bulk materials now handled? Properly *placed* to move, store and reclaim as needed? Does present system starve or flood processing equipment at any stage? Are the various units in condition to avoid frequent troublesome costly shutdowns?

If questions like these cannot be answered with a clear "yes," call in S-A engineers. Let them make a free survey and give you our recommendations.

There are three good reasons why S-A can help you save time, money and worry on your bulk material handling . . . first, S-A engineers have been solving conveyor problems for nearly 50 years, with a record of thousands of successful installations . . . second, S-A builds all types of conveyors and elevators — and you are assured the right conveyor for each job . . . third, you will find the entire S-A staff helpful and cooperative in every respect.

BUCKET ELEVATOR
•
SUPER-CAPACITY
BUCKET ELEVATOR
•
PIVOTED BUCKET
CONVEYOR-ELEVATOR
•

Write us or phone the nearest S-A branch engineering office.



CRUSHER TYPE
BUCKET ELEVATOR

STEPHENS-ADAMSON MFG. CO.

3 RIDGEWAY AVENUE, AURORA, ILLINOIS · LOS ANGELES, CALIF. • BELLEVILLE, ONT

Designers and Manufacturers of All Types of
BULK MATERIAL HANDLING EQUIPMENT

new and **important** to you

Here are the advantages to you of Lebanon's new **CENTRI-DIE** casting process—

1. Greater density, resulting in enhanced physical properties.
2. Production of assorted parts and shapes not practicable by static methods.
3. Uniform strength throughout, as no flow lines exist.
4. Production of alloys, difficult or impossible to forge.

LEBANON STEEL FOUNDRY
LEBANON, PA.
"In the Lebanon Valley"



Send for this FREE Bulletin

Write on your business letterhead or fill in this convenient coupon and we will send you a copy of the Bulletin "CENTRI-DIE CASTINGS".

Lebanon Steel Foundry
Lebanon, Pa.

Please send me a copy of your Bulletin E describing the NEW CENTRI-DIE Process of centrifugal casting.

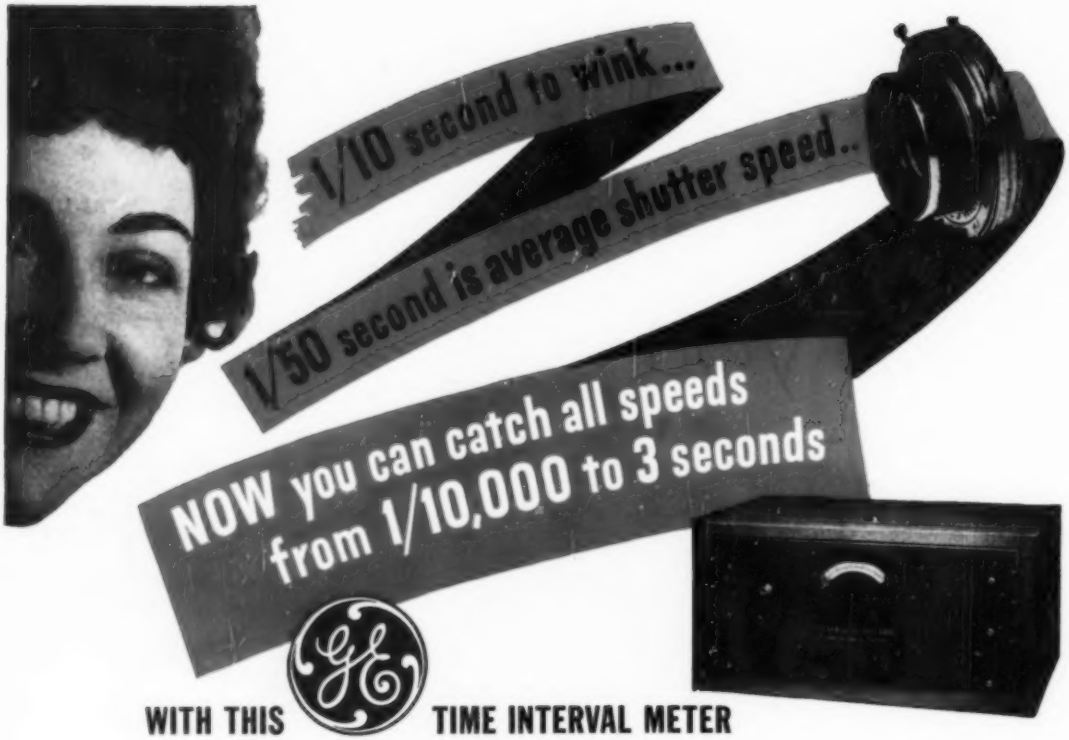
Name.....
Title of position.....
Name of Company.....
Address.....

LEBANON *ALLOY AND STEEL* Castings

CIRCLE L

CONTENTS

Centrifugal Casting in Permanent Molds
Advantages of Centrifugal Casting
Various Methods Now Employed
1. True Centrifugal Casting
2. Semi-Centrifugal Casting
3. Pressure Casting
New Developments in True Centrifugal Casting
The CENTRI-DIE Process
English Developmental Work by Firth-Vickers
Lebanon Steel Foundry Obtains Firth-Vickers License
Applications of new CENTRI-DIE Method
Finishing Procedures
Inspection Methods
New CENTRI-DIE Equipment at Lebanon Steel Foundry
General Type Compositions Adaptable to CENTRI-DIE Production



WITH THIS GE TIME INTERVAL METER

How to determine the speed of camera shutters as they rolled off the production line? How to do it quickly and accurately?

That was the problem faced by Graflex, Inc., of Rochester, N. Y. The method formerly used to determine these speeds was to take photographic exposures of the shutters in action. This accomplished the quality-control test satisfactorily. But it was slow and expensive! And the job was a manual operation. In the second place, developing the film took time!

The problem was given to General Electric. The result was a time interval meter . . . an instrument that measures time interval speeds 1000 times faster than the wink of an eye.

This gave Graflex a new quality-control instrument . . . an instrument that did the job faster and saved money. But its use didn't stop here. Many of these equipments soon found their way into other industries . . . industries where the problem was measuring time intervals.

General Electric engineers have helped solve thousands of such problems for industry. Frequently, the result has been a new testing and measuring equipment. Equipment that today is saving time and money for industry!

Your problem may justify a development program to create a new product, particularly if the problem is a common one. Or, maybe, our engineers can recommend an instrument from the many testing and measuring equipments already available . . . proved equipments that are doing jobs on problems similar to yours.

Write us about your problem. Maybe we can help you.

Apparatus Dept., Section G800-42,
General Electric Co., Schenectady 5, N. Y.

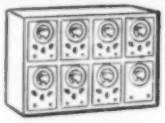
General Electric testing and measuring equipments for nearly every industrial process



Resistance and Insulation Testing Equipment

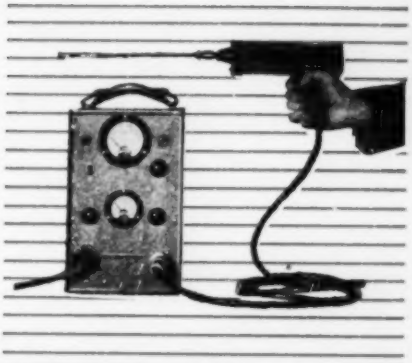


Time, Speed and Torque Equipment



Force, Strain and Thickness Gages

LEAK DETECTION . . . How new portable unit cuts production testing time . . .



This portable G-E Leak Detector has proved such a time saver for quality-control testing of pressurized systems for leaks that one manufacturer is already using over 30 of the units on his production line. Another just placed his order for 20.

So sensitive it can detect a leak which would permit the escape of only 1/100 of an ounce of freon in one year . . . yet entire equipment only weighs 18 pounds. Designed for locating leaks in refrigerators, home freezers, air conditioners, or tanks, boilers, piping and other closed systems into which Freon or some other halogen compound can be introduced as a tracer. Write for GEC-233A.

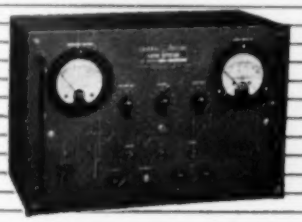
SURFACE TESTING . . . with this kit you can check 25 degrees of surface finish . . .



Ideal for engineers, draftsmen, machine operators, inspectors, etc., for specifying and inspecting finish or roughness of machined parts. Kit provides standard roughness specimens ranging from smoothness of bearings to roughness left by a flame cut. These specimens consist of a set of metal blocks, each representing a degree of surface roughness.

Simple to use! Tests can be made either visually or by the sense of touch. Thus, little or no experience is required to put the standards into operation. Write for GEA–4335.

CHEMICAL ANALYSIS . . . mercury-vapor detector tracks down dangerous fumes . . .

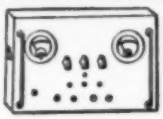


Severe and difficult symptoms make "mercurialism" (poisoning from mercury vapor) hard to detect. That's the reason many laboratories, factories, and 13 state health departments use the G-E mercury-vapor detector to diagnose these fumes and thereby provide adequate safety measures.

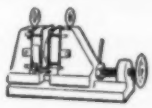
Enclosed in an attractive, gray-steel case, this instrument is portable, lightweight and easy to operate. Its ability to indicate concentration of mercury vapors in a few seconds makes it ideal for either laboratory or factory. You can use wherever 115-volts, 60-cycle power is available. Write for GEA-4390A.



Color, Light and Spectro Equipment



Chemical Analysis Equipment



Magnetic Equipment

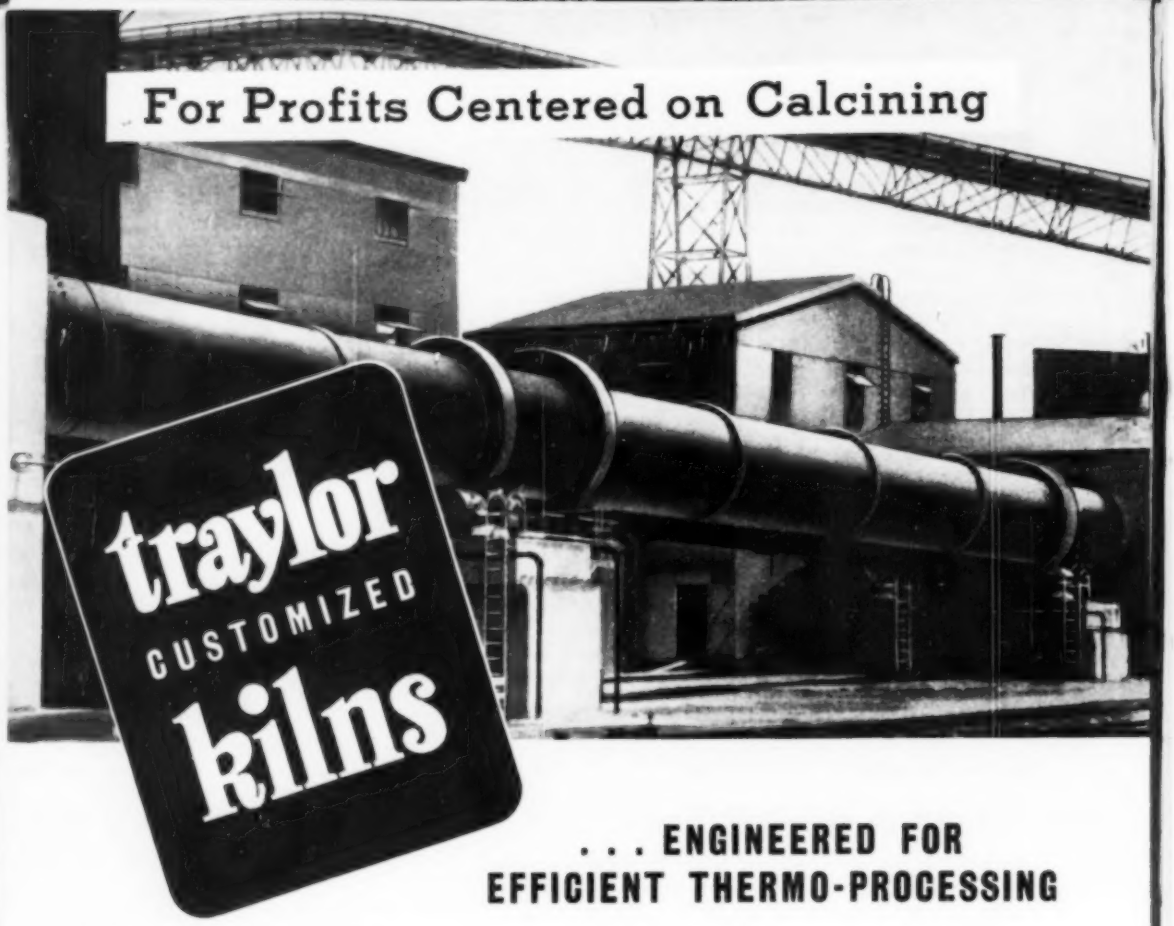


Electric Circuit Testing Equipment



Vibration, Sound and Balancing Equipment

GENERAL ELECTRIC



. . . ENGINEERED FOR EFFICIENT THERMO-PROCESSING

OPERATING AND MAINTENANCE costs of any Traylor Kiln are low because Traylor's vast kiln building experience has developed sound design and construction over many years. Of chief importance is the accurate alignment and rigidity of Traylor Kiln Shells. Electro-welded to unit strength . . . reinforced at every circumferential joint . . . with added strength of extra-thick plate under each riding ring . . . Traylor Kiln Shells are easy turning.

Accurate control and efficient utilization of applied heat is engineered into every Traylor Rotary Kiln. Analysis of the specific application *before building* each Traylor Kiln assures understanding of the problems at hand . . . maximum efficiency of the process planned.

Learn the full story of more profitable thermo-processing. Write today giving a brief outline of your requirements for more specific information on Traylor Rotary Kilns, Coolers and Dryers.

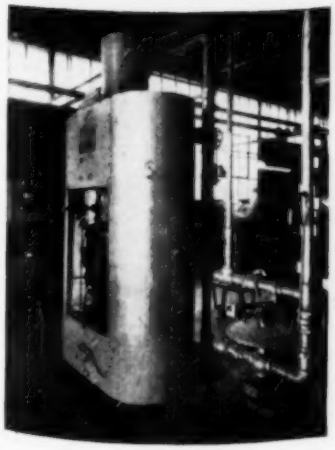
TRAYLOR ENGINEERING & MANUFACTURING CO.
111 Mill Street, Allentown, Pa.
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.
Sales Offices: New York, N.Y., Chicago, Ill., Los Angeles, Calif.

TRAYLOR
ROTARY KILNS
Coolers · Dryers · Feeders
Gyratory Crushers · Reduction Crushers
Jaw Crushers · Grinding Mills

A "Traylor" Leads to Greater Profits

"LECTRODRYERS DRY WITH ALCOA ACTIVATED ALUMINA"

...this statement, made 16 years ago, is still true today!



Charged with ALCOA *Activated** Alumina, the *original* Lectrodryer went to work 16 years ago—and is still on the job—drying gas for heat treating steel at Thomas Steel Company. Since then the idea of dehumidifying gas for metallurgical purposes has become common practice.

From this early beginning, Pittsburgh Lectrodryer Corporation has pioneered all over the world in the drying of liquids and gases, and continues to be one of the leading manufacturers in the field . . . And ALCOA *Activated* Alumina is *still* the standard desiccant used in their machines.

There are good reasons why equipment manufacturers have used ALCOA *Activated* Alumina through all these years:

- **ALCOA *Activated* Alumina dries liquids and gases to a lower dew point than any other commercial adsorbent.**
- **It is uniform in purity, composition and structure.**
- **It is non-toxic and is inert to most gases and vapors.**
- **The particles are strong, and do not break down on repeated cycles of saturation and re-activation.**
- **Neither liquid water nor wet steam causes disintegration.**

Although it has little resemblance to the modern Lectrodryers produced today, Lectrodryer "No. 1" has been in service since 1932 at Thomas Steel Co., Warren, Ohio, drying cracked natural gas for heat treating carbon steels.

Operating economies result, not only from the great length of time that ALCOA *Activated* Alumina can be used, under normal circumstances, but also because the cost of ALCOA *Activated* Alumina is relatively low. Let us send you complete information on this stable, economical drying agent. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 1778 Gulf Building, Pittsburgh 19, Pennsylvania.

* Reg. T. M. of Aluminum Co. of America

ALCOA

ALCOA CHEMICALS

ALUMINAS AND FLUORIDES

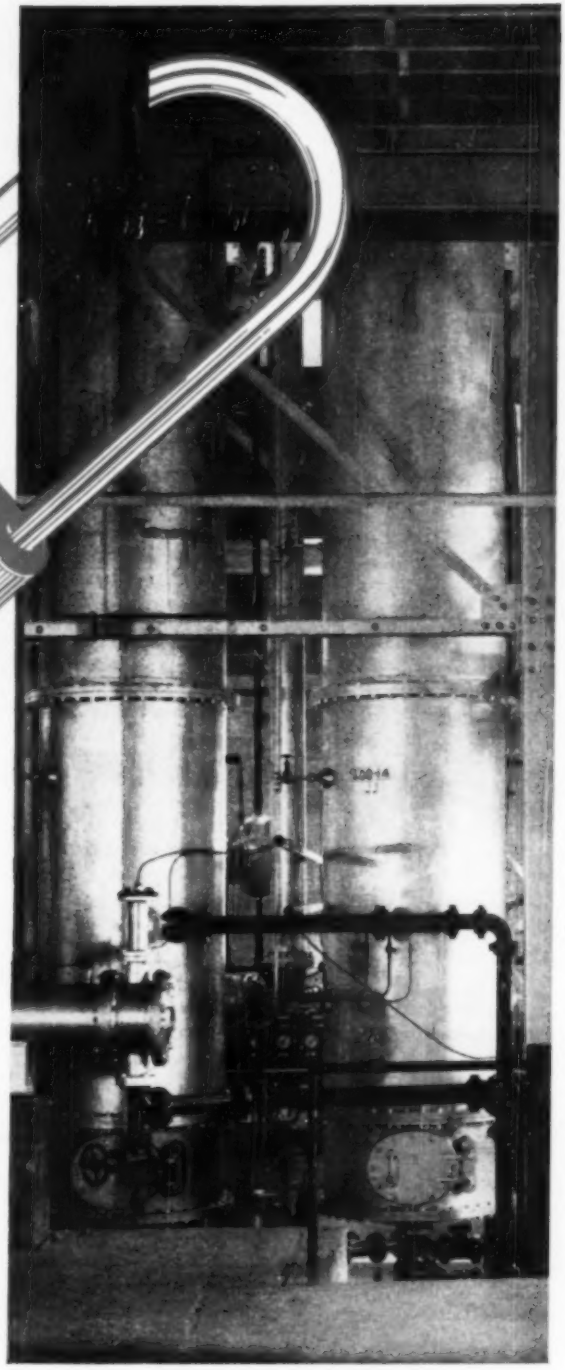
ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINA
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE

BUFLOVAK LOW-TEMPERATURE EVAPORATORS

safeguard...

THE GOOD QUALITIES OF YOUR CONCENTRATED PRODUCT!





BUFLOVAK'S Low-Temperature Evaporators protect the quality of the most delicate materials . . . thus offering safe treatment for any Food products or Chemicals.

These new BUFLOVAK Evaporators operate at extremely low temperatures and pressures. You are assured of dependable operations, day after day, with long operating periods. Automatic controls simplify operation, save labor, and give uniform results, even to the density of the product.

Added profits from BUFLOVAK equipment result from uniform, high product quality at low production cost. And, BUFLOVAK Low-Temperature Evaporators are sold outright with *protective performance guarantees!*

Other BUFLOVAK Equipment for processing Chemicals and Foods include DRYERS, SOLVENT RECOVERY and PROCESSING EQUIPMENT. Send for Bulletin No. 342.

BUFLOVAK EQUIPMENT

Division of Blaw-Knox Co.

1551 FILLMORE AVE. BUFFALO 11, N. Y.

A double killing...



The Bettmann Archive

In its early beginnings, nearly a half-century ago, Niagara Alkali set itself two big tasks to lick . . . to pioneer in developing several important new electro-chemical products . . . and to perfect new methods and techniques for keeping Niagara products and service at the highest peak of quality and efficiency.

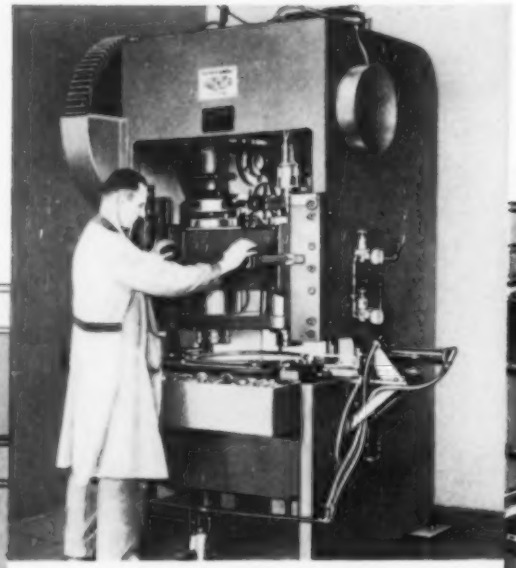
Rely on Niagara for high standards of quality and experienced technical assistance in the use of Niagara Caustic Soda, Caustic Potash, Carbonate of Potash, EBG Liquid Chlorine, Paradichlorobenzene and Niagathal (Tetrachloro Phthalic Anhydride).

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

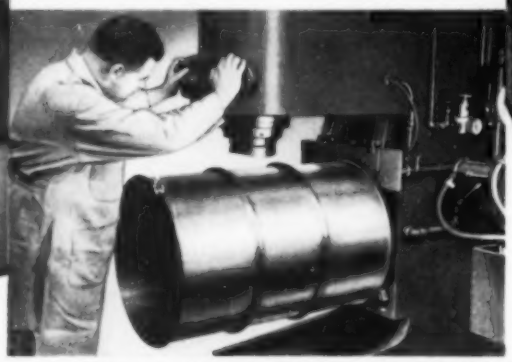
LIQUID CHLORINE • CAUSTIC POTASH • CARBONATE OF POTASH • PARADICHLOROBENZENE • CAUSTIC SODA • NIAGATHAL (TETRACHLORO PHTHALIC ANHYDRIDE)

How America's Drum Manufacturers



New Tri-Sure Presses Install Flanges in a Single Operation

The new Tri-Sure presses pictured here, the result of many years of research, enable drum manufacturers to convey the drumheads or drum shells to the presses and (1) *puncture* the head or shell, and (2) *install* ¾" and 2" flanges—all in a *single, continuous* operation. These new Tri-Sure presses accomplish in one operation what formerly required four separate steps for the drumhead and two separate steps for the shell. The result is a tremendous saving in time, and the maintenance of an absolutely uniform standard of accuracy in flange insertion.





Every product is safe

EVERY DRUM MANUFACTURER CAN SUPPLY YOU WITH DRUMS

American Can Company
Toledo, Ohio

R. E. Chapin Mfg. Works, Inc.
Batavia, N. Y.

Cleveland Steel Barrel Company
Cleveland, Ohio

Eaton Metal Products Corporation
Omaha, Nebr.

Florida Drum Company, Inc.
Pensacola, Fla.

Geuder, Paeschke & Frey Co.
Milwaukee, Wisc.

Giant Manufacturing Co.
Council Bluffs, Iowa

The Globe Steel Barrel Co.
Cleveland, Ohio

Inland Steel Container Company
Chicago, Ill.
Jersey City, N. J.
New Orleans, La

J & L Steel Barrel Co.
Bayonne, N. J.
Cleveland, Ohio
Gretna, La.
No. Kansas City, Mo
Philadelphia, Penna.
Port Arthur, Tex.

Manion Steel Barrel Co.
Rouseville, Penna.

Myers Drum Company
Richmond, Calif.

National Enameling & Stamping Co.
Granite City, Ill.
Laurel Hill, L. I., N. Y.

National Steel Container Corporation
Chicago, Ill.

Riedinghaus Metal Products Co.
St. Louis, Mo.

Niles Steel Products
Niles Plant—Stevens Plant
Niles, Ohio

Are Meeting Today's Demand for

PACKAGES THAT PROTECT



TODAY, American industry is asking not only for *more* drums than ever before, but for drums which are so strong, well-constructed and perfectly equipped that they offer absolute security to their contents.

To meet the increasing *demand*, the steel shipping container industry has doubled its output in less than a decade—with an annual output of 1,000,000 tons of sheet steel—making it the second largest single user of sheet steel in America.

To maintain the highest standards of *quality*, drum manufacturers are now applying new techniques that assure smoother drums of greater strength and durability.

And to provide the *protection* which fine products require—protection from seepage, leakage and tampering—every drum manufacturer in the United States is equipped to install Tri-Sure Closures*.

Tri-Sure flanges, octagonal-shaped to prevent turning, are inserted at the time of manufacture and made an integral part of the steel container body.

Precision dies for this operation are in the plants of all drum manufacturers. By just specifying "Tri-Sure Closures" to your supplier, your drums are delivered with flanges that are as strong as the drum itself, and plugs which screw securely into the flanges — ready for your application of the leak-proof, tamper-proof, heavy-gauge Tri-Sure seals.

*The "Tri-Sure" Trademark is a mark of reliability backed by 26 years serving industry. It tells your customers that genuine Tri-Sure flanges (inserted with genuine Tri-Sure dies), plugs and seals have been used.

Play Safe by Specifying Tri-Sure Closures on Every Drum Order

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

in drums equipped with **Tri-Sure** CLOSURES

EQUIPPED WITH TRI-SURE FLANGES AND PLUGS

The Ohio Corrugating Company
Warren, Ohio

Rheem Manufacturing Company
Bayonne, N. J.
Chicago, Ill.
Houston, Tex.
New Orleans, La.
Richmond, Calif.
South Gate, Calif.
Sparrows Point, Md.

Southern States Iron Roofing Company
Savannah, Ga.
Hattiesburg, Miss.

Southline Metal Products Company, Inc.
Houston, Tex.

Stainless & Steel Products Co.
St. Paul, Minn.

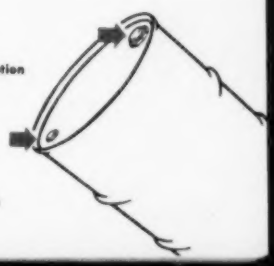
The F. C. Thornton Co.
Cleveland, Ohio

United States Steel Products Company
Alameda, Calif.
Beaumont, Tex.
Chicago, Ill.
Los Angeles, Calif.
New Orleans, La.
Sharon, Penna.

United Steel Barrel Corporation
Philadelphia, Penna.

United Steel Barrel Corporation of Delaware
Wilmington, Dela.

Wheeling Steel Corporation
Wheeling, W. Va.





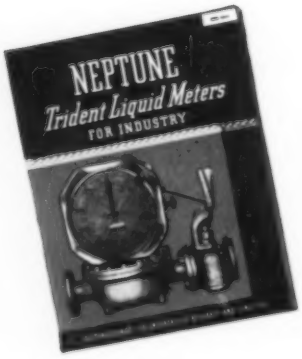
IT COSTS SO LITTLE TO KNOW

with NEPTUNE METERS

Liquids flowing through your plant show up in Profit & Loss—as raw materials or saleable products—as costs for heating or cooling—and in many other ways. Even the quality of your product depends on the control you have over these liquids.

It costs as little as a cent a day to keep close, accurate control with a Neptune liquid meter. No doubt about it—it pays to put a meter at each key point in your liquid lines. Measure liquids coming into your plant. Measure liquids delivered to each process, department or storage tank. Measure liquids shipped out of your plant. There's even a Neptune meter for putting just the right amount of liquid into a batch—automatically.

Already in service on 100 industrial liquids, Neptune meters are positive displacement type. They're quality built, simple in design for sustained accuracy. Ask experienced Neptune engineers for help in selection and installation. There's a Neptune office handy to you.



Ask for Bulletin 566-4—a gold mine of information on the accurate metering of industrial liquids.

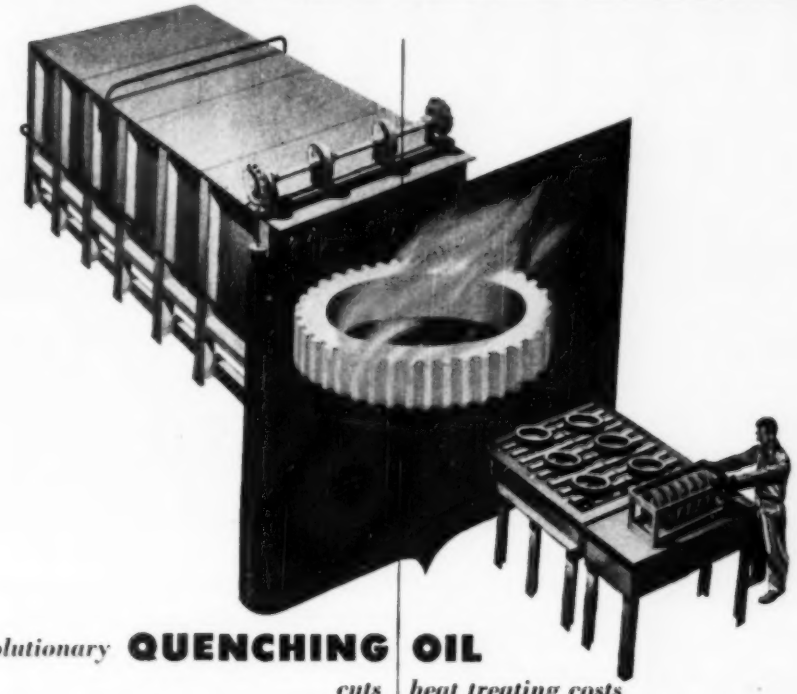
NEPTUNE *liquid* METERS

NEPTUNE METER COMPANY

50 WEST 50TH STREET, NEW YORK 20, N. Y.

Branches: Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, Mo., Los Angeles, Louisville, Philadelphia, Portland, Ore., San Francisco, and Long Branch, Ontario

How industry makes multiple savings with Gulf Quality Oils and Greases:



Revolutionary **QUENCHING OIL** *cuts heat treating costs*

For proper hardening of many types of steel, fast cooling is required. Water, however, may be too fast—often causes distortion and cracking.

After years of extensive research on this problem, Gulf technologists developed Gulf Super-Quench, a revolutionary quenching oil that has a much faster cooling rate than conventional quenching oils, but shows no greater tendency to cause distortion and cracking.

Typical of reports on the outstanding performance of this remarkable quenching oil is one from the Chief Metallurgist of a large machine tool plant: "When we used a conventional quenching oil, we had difficulty in getting the minimum hardness specified for our gears. With Gulf Super-Quench we consistently average well above the required hardness. Super-Quench has also made possible a big reduction in cleaning time, thus reducing our cleaning costs."

Gulf Super-Quench is one of more than 400 Gulf quality oils and greases that are helping plant operating men make multiple savings through improved production and lower costs. Make sure your plant is getting the advantage of all recent developments in petroleum science. Write, wire, or phone your nearest Gulf office today and ask a Gulf Lubrication Engineer to call.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
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GULF INDUSTRIAL LUBRICATION

Helps make machines produce more at lower cost

Stainless Steel

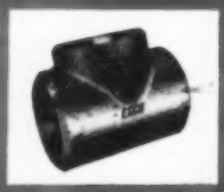
PIPE FITTINGS

IN SPECIAL CORROSION-RESISTING ANALYSES









Special analyses produced to meet unusual requirements often enable *ESCO* stainless steel pipe fittings to solve corrosion problems which prove too severe for the standard stainless types. These special analyses include du Pont specifications 820A and 820B, *ESCO* Alloy 20 (Duriron license) and many other special analyses. And, of course, the standard AISI types such as 304, 316, 317 and 347, are regularly available.

ESCO stainless steel pipe fittings are produced in screwed, flanged and welding types. Cast in raised letters on each fitting is its metallurgical classification. This lasting identification provides a permanent record of its corrosion resisting properties.

All *ESCO* pipe fittings have uniform wall sections. All are properly proportioned, accurately finished, rigidly inspected and hydrostatically tested.

Screwed Fittings are available in sizes from ⅛" to 4". Special fittings made to engineering specifications.

Flanged Fittings are produced in sizes from 1" to 14". Special sizes and shapes made to order.

Welding Fittings produced in socket weld, butt weld and special types.

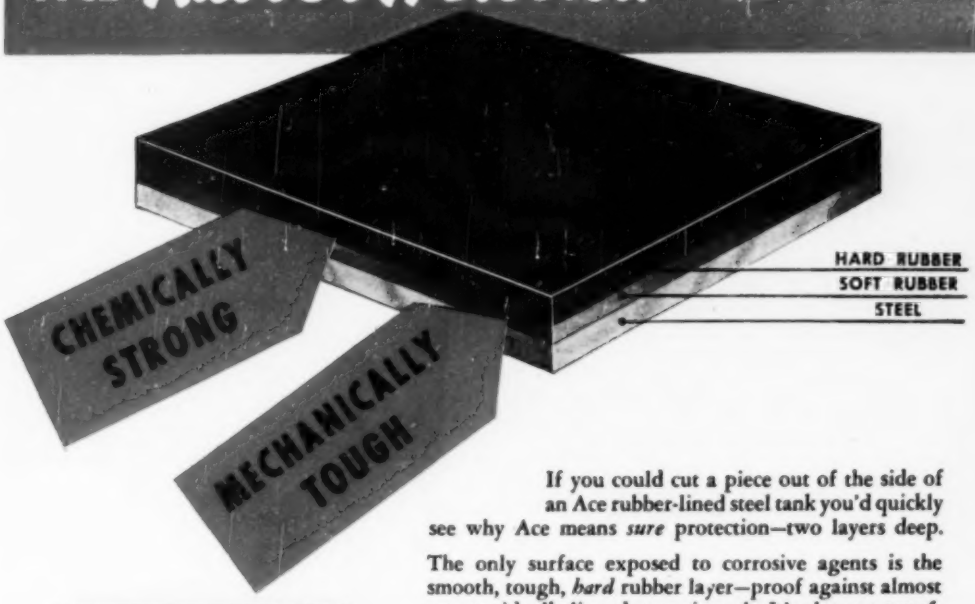
Write us on any problem, and the facilities of our metallurgical and engineering staffs will be placed at your disposal. Electric Steel Foundry, 2143 N.W. 25th Avenue, Portland 14, Ore. Offices in Eugene, Oregon; Chicago; Honolulu; Houston; Los Angeles; New York City; San Francisco; Seattle; Spokane. In Canada, *ESCO* Ltd., Vancouver, B.C.

Distributors in all principal cities

ESCO

Stainless and High Alloy Steels for the Process Industries

ACE *Rubber-Protected* EQUIPMENT

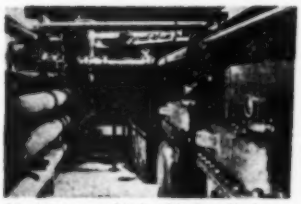


If you could cut a piece out of the side of an Ace rubber-lined steel tank you'd quickly see why Ace means *sure* protection—two layers deep.

The only surface exposed to corrosive agents is the smooth, tough, *hard* rubber layer—proof against almost every acid, alkali, and corrosive salt. It's also age-proof. Underneath is a layer of resilient, shock-resistant soft rubber that firmly bonds the hard rubber to the steel—a bond so strong the rubber can't be peeled off, and won't loosen or blister. There's extra protection at the seams, and in the well-rounded fillets and corners. Flanges, too, are rubber faced.

Ace also provides all-hard-rubber or all-soft-rubber linings, of natural or synthetic rubber. Ace rubber protected tanks, pumps, piping, valves, fittings and utensils are available in standard or special constructions for complete chemical processing, storage or circulating systems. Write for "Ace Rubber Protection," 64 pages of data you'll find valuable.

ACE PLASTICS: Investigate Ace corrosion-resistant plastics too, such as Ace Saran and Parian (polyethylene) pipe, tubing, fittings and molded parts. With both hard rubber and plastics to choose from, we'll be glad to recommend the *one best* material for any job of yours.



No "guess-work" in this installation—it's practically all Ace-protected. Here you see Ace rubber-lined pipe, fittings, valves and tanks and Ace all-hard-rubber pipe and fittings handling corrosive liquids.



Ace rubber coverings can be applied to intricate shapes, such as conveyor screws, agitators, etc. These typical mixer parts are lined with Neoprene.



Shown here is one view in the spotless modern plant where Swift's Animal Protein Colloid is made. Operation is continuous, automatic . . . the product is "untouched by human hands," not contaminated by foreign substances.



Investigate this Modern Process Agent:

Swift's Animal Protein Colloid*

(made from an exclusive Swift Process)

Does your manufacturing process require . . .

1. An emulsifier?
2. A flotation agent?
3. A gel structure?
4. A settling agent?
5. A protective coating?
6. A sizing agent?
7. A carrier of pigments?
8. An impregnating agent?
9. A base for pigment?
10. An oilproofing agent?
11. A flocculating agent?
12. A clarifying agent?
13. A filtering agent?
14. A stiffening agent?
15. A mordant?

This modern process agent, Swift's refined Animal Protein Colloid, has properties which may be employed in a wide number of processes. Even though you have used other processing agents, be sure you investigate Swift's Animal Protein Colloid now. It has unusual properties. It may meet the requirements of your present operations or help in developing new ones.

*Commercially high quality bone glue.

What is this modern process agent?

Swift's Animal Protein Colloid is made by an exclusive Swift process. Protein liquor is extracted from bones and highly concentrated. This pure liquid falls on a bed of dry finished product which adheres evenly to the droplets. Then, by continuous and automatic schedule, these droplets travel through driers and are milled and screened. This whole operation is under *precise synchronized control* and is completed in relatively short time.

The result is a uniform granular form that goes into solution rapidly. It's a purified product, light amber in color.

Because plant and machinery are kept spotlessly clean — the finished product does not touch material which can contaminate it with foreign substances . . . because of the precise control possible with Swift's exclusive process, Swift can bring you this *superior* processing agent. And Swift's Animal Protein Colloid has the same high quality and uniform characteristics the year 'round.

Swift's technical service yours, investigate now

Write or phone for one of Swift's special representatives. He will call and discuss Swift's Animal Protein Colloid with you. This process agent may be just what you are looking for. Write to:

Swift & Company

ADHESIVE PRODUCTS DEPARTMENT

4105 Packers Avenue, Chicago 9, Illinois

quality and quantity

are the major considerations in marketing an Armour product.

By means of equipment designed and constructed by the Foster Wheeler Corporation, Armour and Company converts crude animal and vegetable oils into edible oils to be used for shortening, margarine, salad and cooking oils. To maintain product quality commensurate with the prestige of the Armour trademark, and production at the proper level to meet existing demands, Foster Wheeler is called on again and again to plan and construct additional plant facilities. Foster Wheeler's outstanding achievements in the field of industrial processing are partly attributable to the skill of FW engineers in applying basic chemical engineering unit operations to a given process.

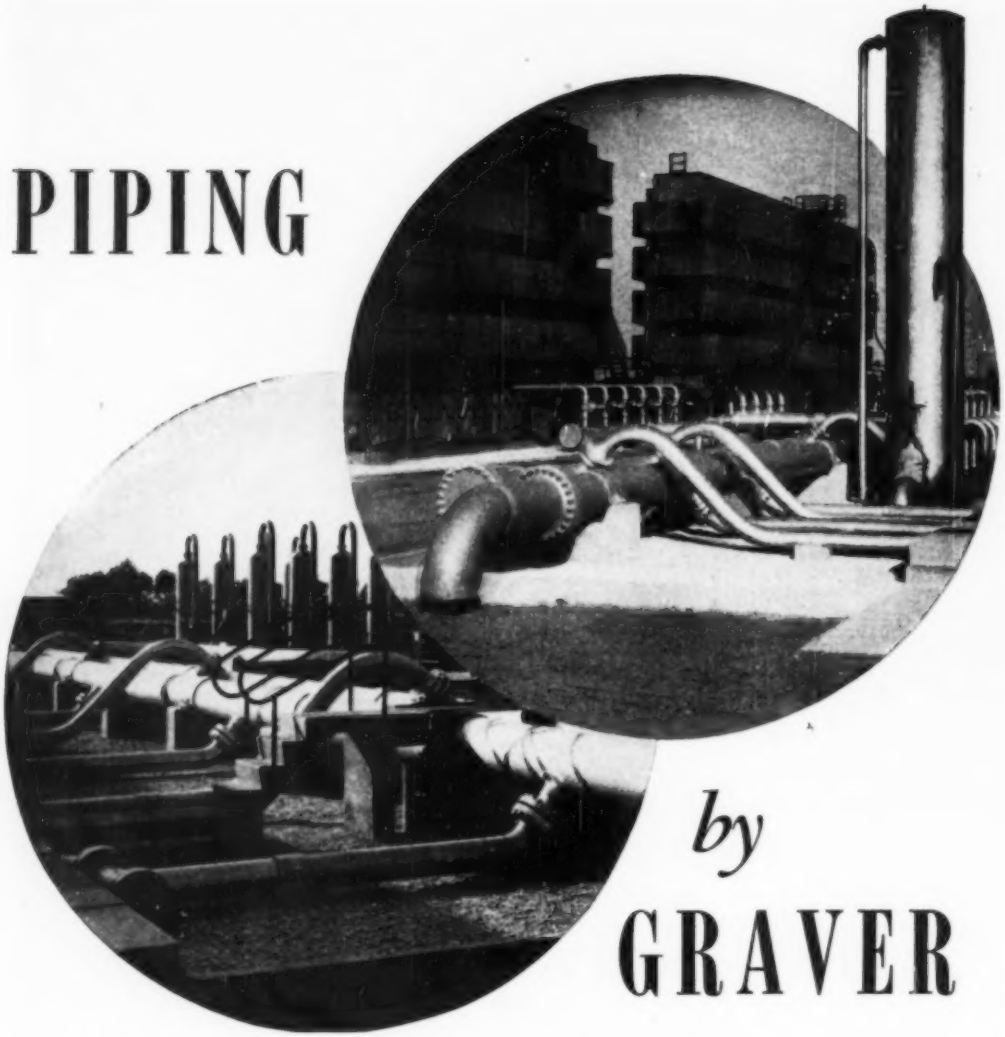


For further information write

FOSTER WHEELER CORPORATION, 165 Broadway, New York 6, New York

FW

PIPING



by

GRAVER

In this case it's piping. In another case it may be erection of heavy vessels, foundations, equipment setting, brick work, electrical installations. Or the entire job may be a Graver job . . . from initial engineering to completion of the field work. In any case the Graver Construction Co. offers a complete service to the petroleum and chemical industries for the engineering and building of new facilities or the expansion and modernization of existing facilities.

Graver's thoroughly seasoned personnel, plus strategically located equipment depots, will prove a valuable asset on your next job. Why not call Graver *today!*

GRAVER CONSTRUCTION CO.

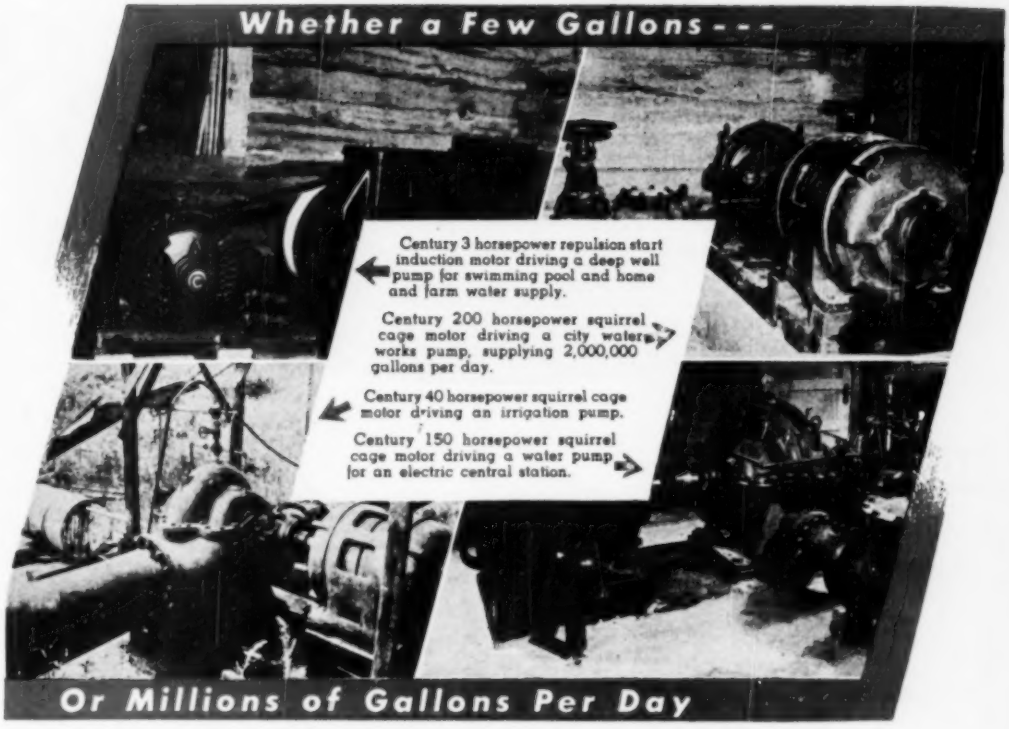
A Division of

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

CHICAGO

NEW YORK — *Engineering Dept.—880 Bergen Ave., Jersey City, N. J.* — **HOUSTON**



CENTURY MOTORS

Supply *Dependable Power*

Over a million Century motor driven pump installations in use is proof of Century's acceptance in the pumping field. These installations range in size from water systems for small cottages to city water systems pumping millions of gallons per day.

In addition to water pumps, Century motors supply power for milk, liquid food and beverage pumps, brine pumps, bilge pumps, pulp pumps, dye pumps, acid pumps, alkali pumps, oil well pumps, and gasoline pumps.

Century pump motors are particularly adapted to the requirements of pumping service. They start and run smoothly and quietly—and with a minimum of vibration Century's triple insulation effectively resists humidity and dampness.

To meet the requirements of any surrounding atmosphere, Century motors are supplied with drip proof, splash proof, totally enclosed fan cooled or explosion proof frames.

Century builds a complete line of electric motors in sizes from 1/6 to 400 horsepower to meet the requirements of industrial and commercial needs.

Specify Century motors for all your electric power requirements.

Century C MOTORS



Popular types and standard ratings are generally available from factory and branch office stocks.

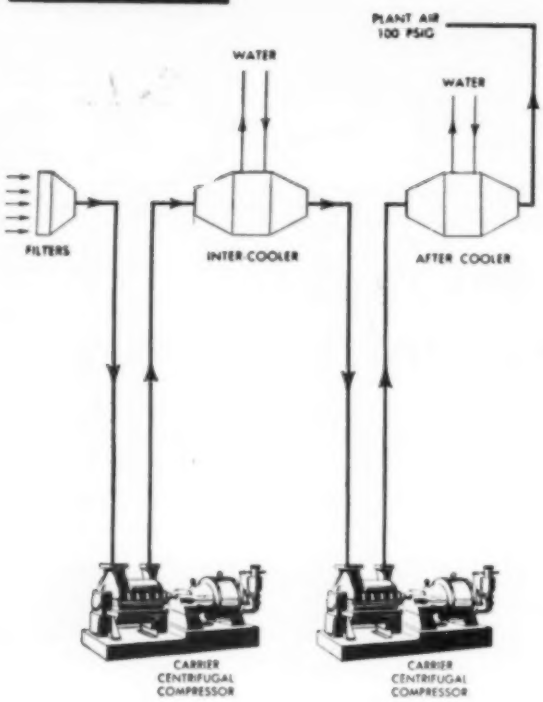
CENTURY ELECTRIC CO., [illegible]

CE-598

PROBLEM:

How to get large volumes of plant air

SOLUTION:



This diagram shows how Carrier Centrifugal Compressors in series easily compress air up to 100 PSIG or even higher. Like other rotating machinery (steam turbines, centrifugal pumps), they do the large jobs better at less cost than by any other means.

Carrier Centrifugals compress air without pulsation—a result important to flow measurement or catalyst beds. Process air is not contaminated by compressor lubricating oil. Efficiency is high for partial loads and is sustained for the life of the equipment. Ruggedly built to Carrier's exacting standards, these compressors operate for years free of the maintenance problems on valves, pistons, etc., that arise with reciprocating equipment. Space requirements are low.

Standard Carrier Centrifugal Compressors with intake volumes between 7000 and 30,000 cfm at discharge pressures of 100 PSIG are available for this application. They are adaptable to direct turbine or motor drives, and can readily be fitted into the plant heat balance.

Carrier is qualified through years of research and experience to help with problems involving large volumes of air and gases. And a staff of Carrier-trained engineers is readily available for consultation. Carrier Corporation, Syracuse, New York.

Carrier CENTRIFUGAL COMPRESSORS • REFRIGERATION EQUIPMENT



It's New!

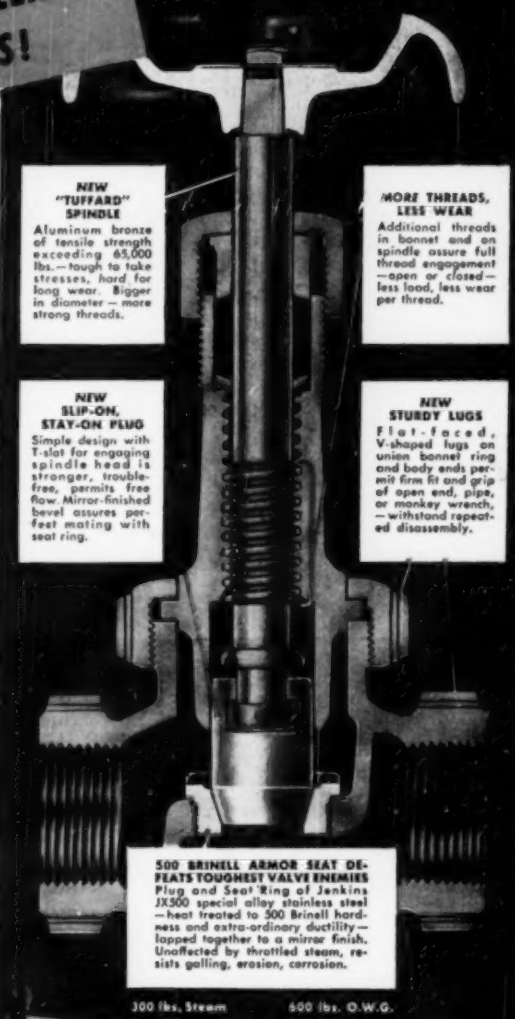
JENKINS ANSWER TO VALVE-KILLING SERVICES!

JENKINS Fig. 976-A

PLUG TYPE

Armor Seat

BRONZE GLOBE VALVE



NEW "TUFFARD" SPINDLE

Aluminum bronze of tensile strength exceeding 65,000 lbs.—tough to take stresses, hard for long wear. Bigger in diameter—more strong threads.

MORE THREADS, LESS WEAR

Additional threads in bonnet and on spindle assure full thread engagement—open or closed—less load, less wear per thread.

NEW SLIP-ON, STAY-ON PLUG

Simple design with T-slot for engaging spindle head is stronger, trouble-free, permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

NEW STURDY LUGS

Flat-faced, V-shaped lugs on union bonnet ring and body ends permit firm fit and grip of open end, pipe, or monkey wrench,—withstand repeated disassembly.

500 BRINELL ARMOR SEAT DEFEATS TOUGHEST VALVE ENEMIES

Plug and Seat Ring of Jenkins JX500 special alloy stainless steel—heat treated to 500 Brinell hardness and extra-ordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

300 lbs. Steam 600 lbs. O.W.G.

BUILT TO BREAK RECORDS FOR LONG LIFE

Now, for the most severe services, you can choose the new Jenkins Fig. 976-A with complete confidence that it will set new economy records. Use it for pressure regulation, bleeds, drips, and drains, or any close regulation of steam that threatens wire drawing. It will lower maintenance, last longer, where entrapped pipe chips, scale, or rust tubercles are a problem.



SMASHED PIPE CHIPS, WIRE, LEAVE NO SCARS

Steel pipe chips and 1/16" wire rod, with Brinell hardness in excess of 300, were crushed between the new Jenkins JX500 Plug and Seat Ring without leaving a scratch or dent. That's proof of super hardness!

Compare Fig. 976-A, part for part, and see why it's as nearly wear-proof, trouble-proof, and maintenance-free as any stock valve can be. Only a few of the dozen ways it's better are shown here. Get the complete story in the new folder. See why it's unrivalled for endurance and economy,—why it's your best buy in plug-type valves! Use coupon.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

LOOK FOR THIS TRADE JENKINS DIAMOND MARK SINCE 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



GET COMPLETE DETAILS—IN THIS NEW FOLDER

Mail Coupon Today!

JENKINS BROS., 80 WHITE ST., NEW YORK 13

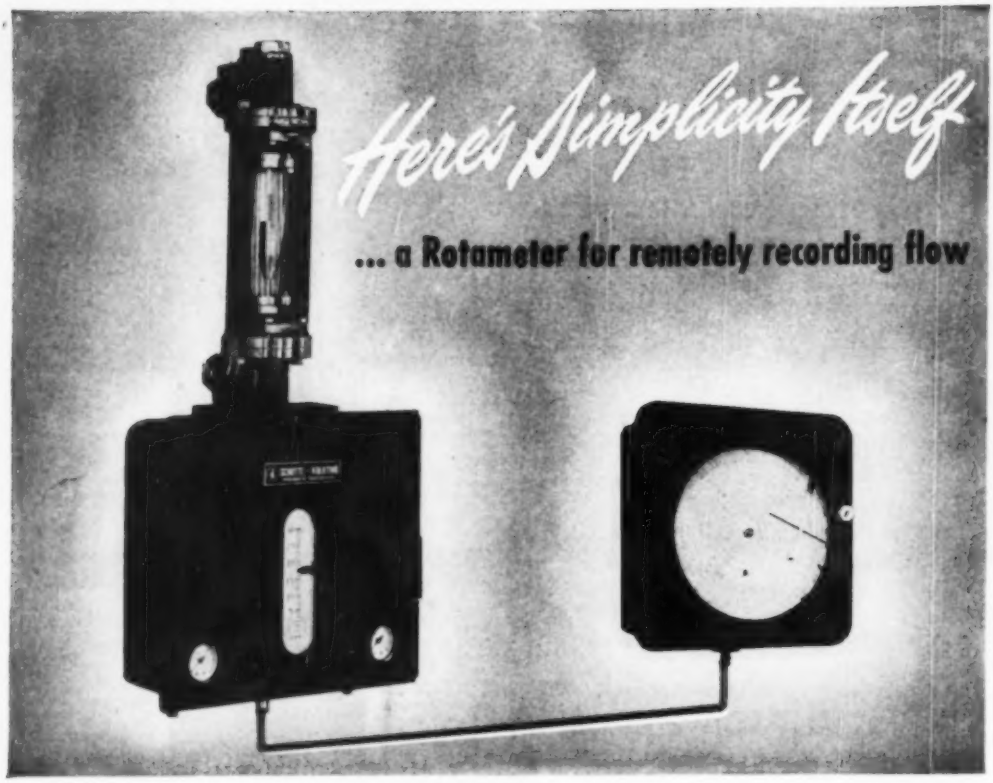
Please send Armor Seat Valve folder—Form 793

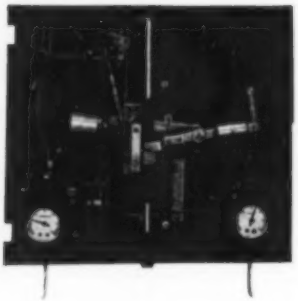
Name _____

Company _____

Address _____

_____





The single pneumatic transmission tube, from the SK Pneumatic Recording Rotameter to the recording instrument, sets new standards of simplicity, economy and accuracy. Eliminating wiring and complicated circuits, this Rotameter has a mechanism within the transmitter which determines and transmits the rotor location to a recorder located in a convenient part of the plant. Of particular importance to you are such benefits as instant response to flow variations, the elimination of fire hazards and the explosion-proof characteristics of the instrument. You can use any one of many make recorders, and maintenance is easy—since the design features simplicity and reliable, trouble-free operation. Complete details on the Pneumatic Rotameter are contained in new Bulletin 18-RC. Write or call for your copy.

SCHUTTE and KOERTING Company

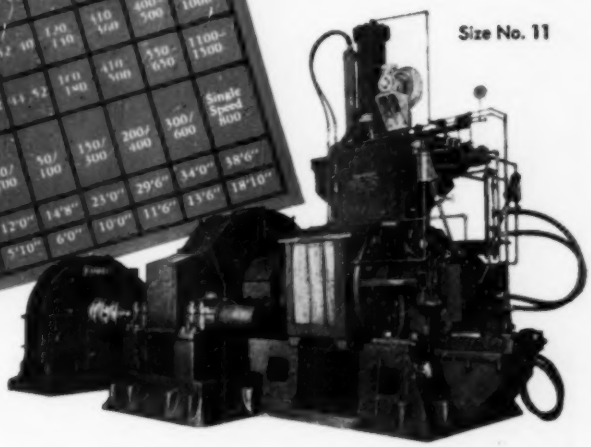
Manufacturing Engineers

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JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS AND FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

THERE'S A BANBURY SIZE TO SUIT YOUR NEEDS EXACTLY

Size of Machine	B	00	1	1-A	3-A	9	11	27
Net Volume of Chamber—Cubic Inches	103	263	1195	1195	4315	11443	14940	37709
Approximate Capacity Stiff Paste Pounds per Batch — Farrel Specific Gravity	Sp.Gr. x 2.5	Sp.Gr. x 3	Sp.Gr. x 24	Sp.Gr. x 24	Sp.Gr. x 85	Sp.Gr. x 225	Sp.Gr. x 300	Sp.Gr. x 600
Approximate Capacity Rubber Stocks Pounds per Batch — Crude Rubber	2	4	24	24	85	225	400	600
1.25 Specific Gravity Stock	3	5	27–44	27–44	100–135	250–300	440–470	700–800
1.50 Specific Gravity Stock	4	6	32–50	32–50	120–150	310–360	400–500	850–1000
2.00 Specific Gravity Stock	5	8	44–52	44–52	160–180	410–500	550–650	1100–1300
Motor Horsepower — Standard and Double Speed	Four Speed 8½/12½/17/25	15/30	50/100	50/100	150/300	200/400	300/600	Single Speed 800
Approximate Floor Space — Length	8'0"	10'0"	12'0"	14'8"	23'0"	29'6"	34'0"	38'6"
Width	5'0"	4'6"	5'10"	6'0"	10'0"	11'6"	13'6"	18'10"



Size No. 11

Banbury mixers are made in 8 standard sizes, from the size B for laboratory or small production work to the huge No. 27 with its net chamber capacity of 37,709 cubic inches. With such a range of machines to choose from, you can select the mixer that will provide the production you require.

Furthermore, Farrel - Birmingham engineers have developed other production units, such as extruders, warming and sheeting mills and calenders, which are *matched in capacity* with the various sizes of Banburys. This means that a layout can be *engineered* that will eliminate the "choking" or "starving" of any machine in the line. Production can be *designed* to flow without costly interruptions and with manual aid and supervision reduced to a minimum. Isn't this worth investigating?



Before you purchase new processing equipment, call in a Farrel - Birmingham engineer. In the meantime, send for a copy of *NEW* bulletin No. 187, "F-B MACHINERY FOR THE PROCESS INDUSTRIES."

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, New York
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston

Farrel - Birmingham

CE

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Please send me, without cost or obligation, a copy of your new Bulletin No. 187.

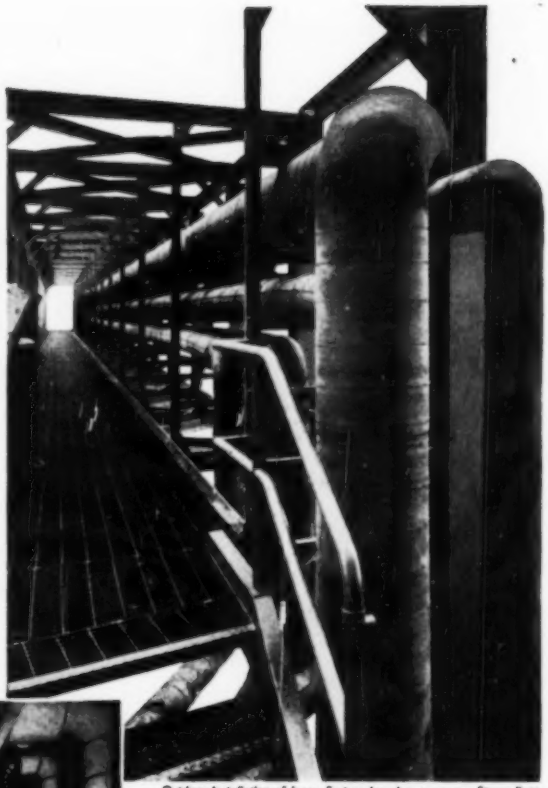
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Company _____

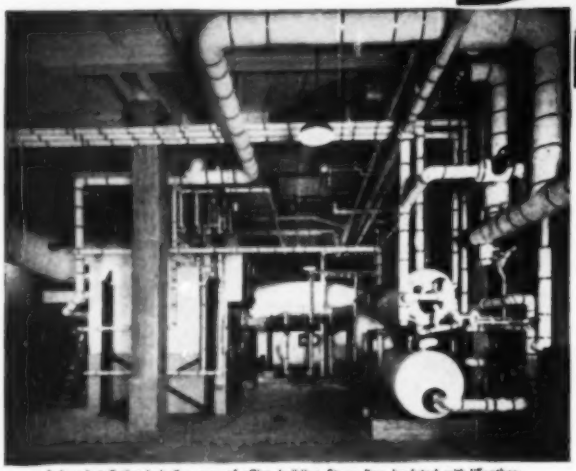
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Two tough steam jobs
INDOORS
OUTDOORS
Efficiently handled with
K&M "FEATHERWEIGHT"
85% Magnesia Insulation



Outdoor installation of large Eastern brewing company. Steam lines covered with double standard thickness "Featherweight" 85% Magnesia Pipe Insulation and weatherproof jacket.



Indoor installation in boiler room of office building. Steam lines insulated with "Featherweight" 85% Magnesia Pipe Insulation and boilers insulated with K&M Insulating Cement.

This outdoor installation required especially dependable steam pressure control . . . since the equipment was part of a large brewing operation. K&M "Featherweight" 85% Magnesia Insulation was specified and excellent results obtained. The indoor heating system required efficient temperature control . . . "Featherweight" solved the problem here. Indoors or out . . . when it's an insulation job . . . that's the place for K&M "Featherweight" 85% Magnesia Insulation.

"Featherweight" 85% Magnesia Insulation combines the high insulating properties of basic Carbonate of Magnesia with asbestos fibers as a binding agent . . . forming a lightweight, fireproof, efficient insulating material.

K&M Distributors, located strategically throughout the country, are experts on the application of K&M insulating materials . . . and can point the way to savings for you. Write us for further information.

K&M best in asbestos

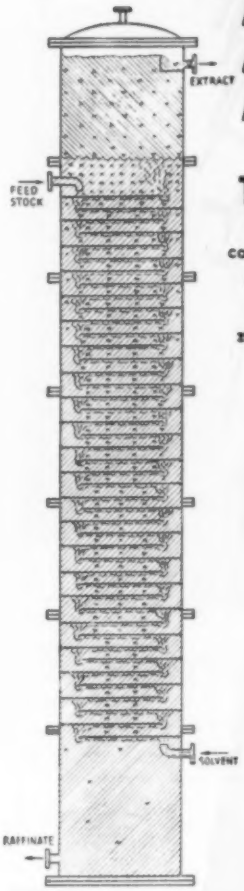
Nature made Asbestos

Keasbey & Mattison Company has made it serve mankind since 1873.

KEASBEY & MATTISON

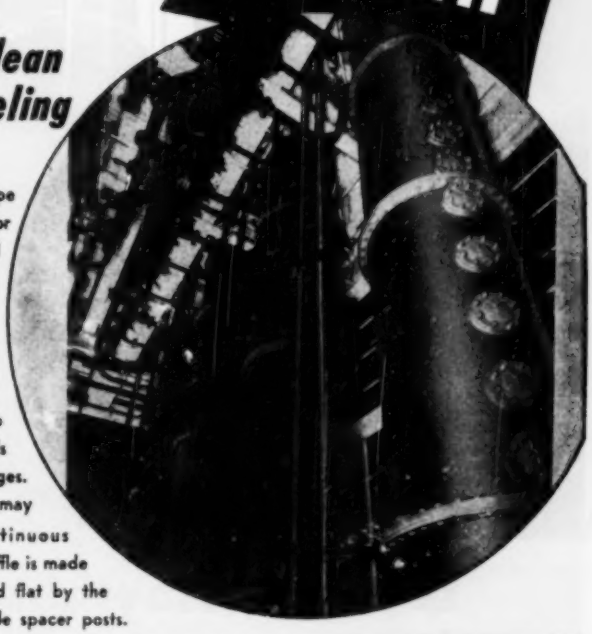
COMPANY • AMBLER • PENNSYLVANIA

SOLVENT EXTRACTION by Vulcan



Diagrammatic sketch of a liquid-liquid extraction column

Efficient
Easy to Clean
No Channeling



THE Vulcan baffle-type liquid-liquid extractor consists of a vertical column packed with a series of horizontal baffles. The turbulent region at the edge of each baffle serves to remix the liquids between stages. Either phase may be the continuous phase. Each baffle is made horizontal and flat by the use of adjustable spacer posts.

This equipment has been highly successful in the organic chemical industry and it is equally suitable for hydrocarbon separations. Each new application is carefully checked in the Vulcan laboratories to assure economical design and to permit performance guarantees.

These extractors are available in all corrosion resistant materials and in diameters to ten feet.

PILOT PLANT

PROCESS DESIGN

MECHANICAL DESIGN

SHOP FABRICATION

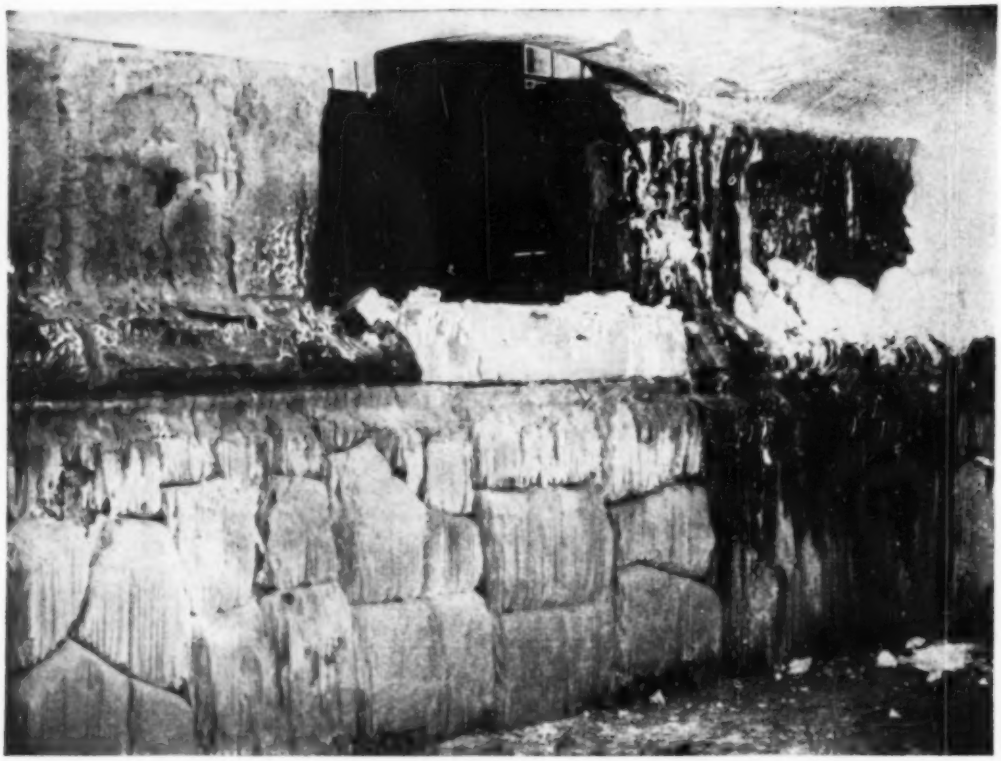
FIELD ERECTION

INITIAL OPERATION

Vulcan **distillation evaporation extraction processes and equipment**

THE VULCAN COPPER & SUPPLY CO., General Offices and Plant, CINCINNATI, OHIO
SAN FRANCISCO NEW YORK BUENOS AIRES

IN CANADA — VICKERS VULCAN PROCESS ENGINEERING COMPANY LTD. — MONTREAL



Is There Anything BETTER Than Corhart Standard Electrocast?

Twenty-one years ago when Corhart Standard Electrocast* was introduced, the glass industry quickly accepted it as a superior refractory which, despite its higher price, was economical for fortifying or "balancing" tough spots in clay furnaces.

Within a few years, the product had become more and more widely used — until today, many glass furnaces throughout the world are built completely of Corhart Standard Electrocast.

Now, however, there is a new and superior Corhart product which can wisely and economically be used to fortify tough spots EVEN in furnaces built of Corhart Standard Electrocast.

The photo above tells the story. A tuckstone of Corhart Zac Electrocast*, by shielding the Zed sidewall under the No. 1 port, reduced the metal cut to 4½" — whereas the metal cut under the Standard Electrocast tuckstone between No. 1 and 2 ports averaged 7" in that less vulnerable position.

This interesting comparison is not an exceptional situation. It is substantially normal. Hence, today, most leaders are switching rapidly to Corhart Zac, as twenty years ago they switched to Corhart Standard Electrocast.

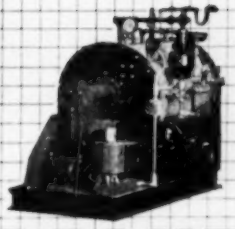
Corhart Refractories Co., *Incorporated*, 16th and Lee Streets, Louisville 10, Kentucky.

*Trade Mark Registered

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

LITTLE GEM

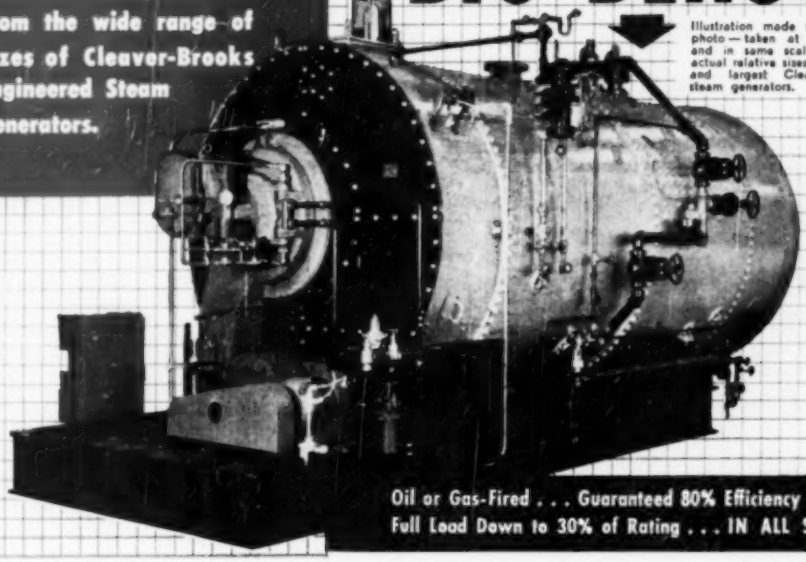


or

BIG BEAUTY

Select to meet your space and steam requirements from the wide range of sizes of Cleaver-Brooks Engineered Steam Generators.

Illustration made from actual photo — taken at same time and in same scale — showing actual relative sizes of smallest and largest Cleaver-Brooks steam generators.



Oil or Gas-Fired . . . Guaranteed 80% Efficiency from Full Load Down to 30% of Rating . . . IN ALL SIZES

WHY search and "shop" for a boiler — install a Cleaver-Brooks engineered and packaged steam generator that fully meets your steam requirements and needs only a minimum of space and headroom.

You can select from a range of sizes 15 to 500 hp. — and you can have your Cleaver-Brooks steam generator equipped for oil, gas, or with a combination burner which permits alternate use of gas or oil and provides for a quick change-over from one fuel to the other.

Equally important—you get Cleaver-Brooks guarantee of at least 80% efficiency from full load down to 30% of rating — with either gas or oil as fuel — and IN ALL SIZES.

Cleaver-Brooks steam generators enable you to burn the available fuel in your area — give you clean, smokeless operation — eliminate fuel and ash handling — need no high or costly stacks — no special foundations — fit under low headroom and into limited space — provide flexible operation to meet fluctuating loads — fully meet all codes.

Available in a size to fit your needs — 15 to 200 p.s.i., 15 to 500 hp. — write for Cleaver-Brooks Steam Generator bulletin.



CLEAVER-BROOKS COMPANY, 339 E. Keefe Ave., Milwaukee 12, Wis.

WRITE on your business letterhead for Free Steam Cost Calculator — a ready reference slide rule showing the comparative steam costs when using oil, gas or coal as fuel.

Cleaver-Brooks

"Packaged" STEAM GENERATORS

HAVE SERVED INDUSTRY FOR MORE THAN FIFTEEN YEARS

CLEAN



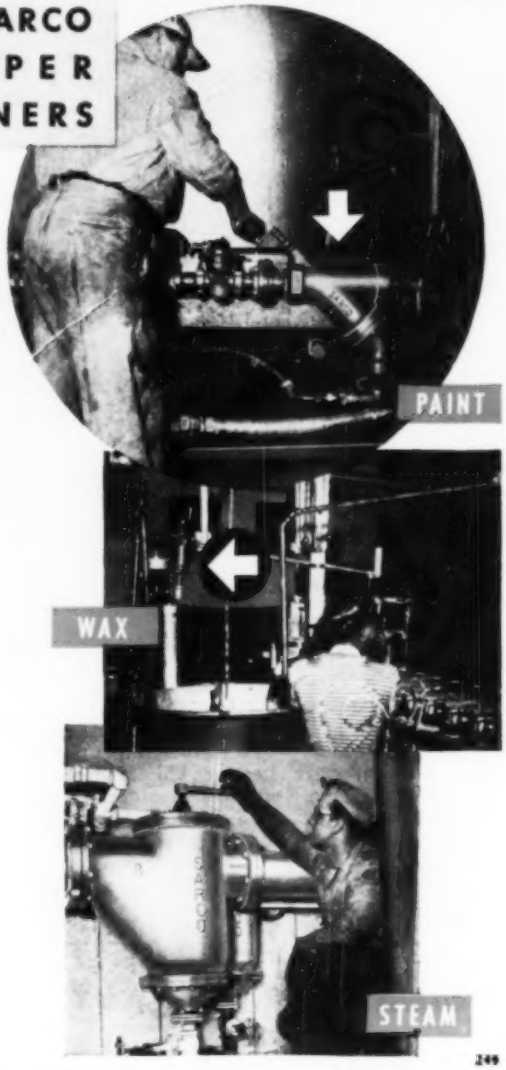
PAINT, WAX
STEAM . . .
OR ANY LIQUID

WITH SARCO
SCRAPER
STRAINERS

Any liquid that can flow through a pipe can be free from impurities down to any size screen you select, with the Sarco Scraper Strainer. It's the last step and a final insurance of the product just before packaging. In the paint plant illustrated, a Sarco is on each of the three tanks in front of the automatic canning machine. The strainer screens are cleaned every few hours by a turn of the handle.

In a large metal plant, exhaust steam from hammers, formerly unusable because of the lint and dirt, is now used for heating. Food syrups, river water and hot wax are other applications.

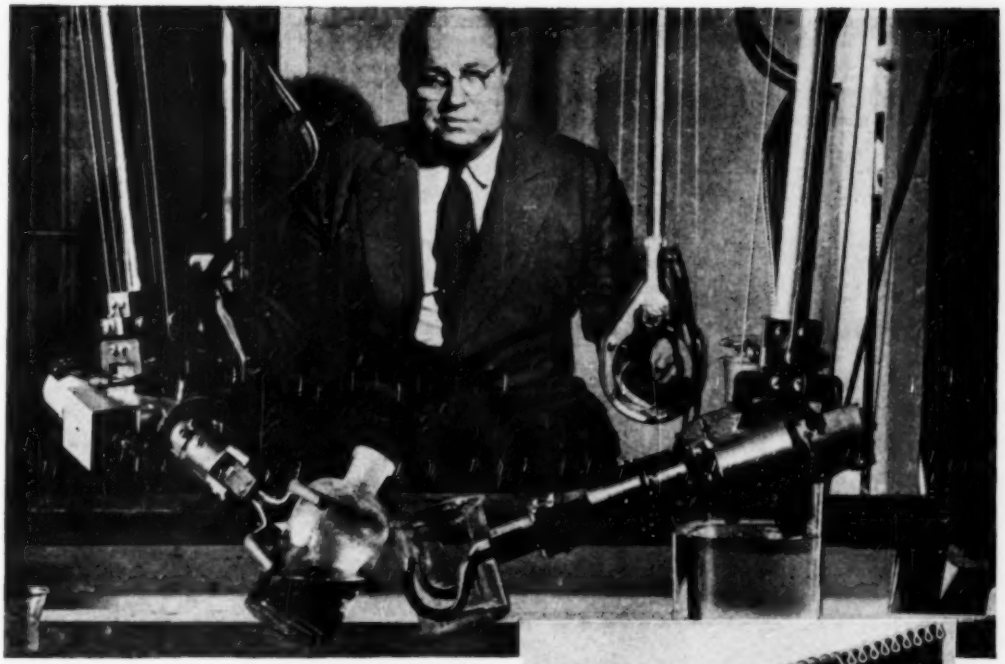
Standard Sarco Strainers are made in four types, ¼" to 8" for pressures up to 900 pounds. Scraper strainers ¾" to 8" and 200 pounds, hand or motor operated. Ask for Catalog Nos. 1200 and 1225.



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SARCO
SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
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Inventor, John Payne, operates the amazing mechanical hands that he and other General Electric scientists, engineers and craftsmen built for the Atomic Energy Commission. It is operated through a thick wall, the manipulation being guided with the help of mirrors.

At right, cut open view of the American Seamless Flexible Metal Hose, with its protective bronze braiding, that conveys actuating brake fluid.



AMERICAN FLEXIBLE METAL HOSE

Helps Probe Atomic Secrets

THIS IS THE WAY to handle lethal, radio-active materials you dare not touch!

These robot hands, with fingers as sure and gentle as a man's, infinitely more powerful when strength is needed, are operated through a thick lead wall. Small electric motors turn the hands at the will of the operator, while other motions are mechanical, with hydraulic force applied through ¼" I.D. American Seamless Flexible Metal Tubing to operate the fingers.

In building this intricate machine the selection of indestructible and trouble-free materials was very important, since the parts themselves are liable to become contaminated and hence difficult to repair, adjust, or replace. For conveying the brake fluid that actuates the nimble steel fingers, our Type S-1, standard American Seamless Flexible Metal Tubing of bronze, was used. It is pressure-reinforced with bronze wire braid.

Whether your own problem is to convey steam, oil, water, other fluids, semi-solids or gases under varying conditions of pressure, temperature, vibration, misalignment, movement or restricted space, you may save time, money and experimentation by consulting American first. Special design to meet your own service requirements costs you nothing extra. Write for literature, and feel free to consult our Technical Department.

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American

METAL HOSE

THE AMERICAN BRASS COMPANY

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General Offices: Waterbury 88, Connecticut

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Dependable Information

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try Mathieson

To the question: "Can you ship us heavy chemicals *now*?" Mathieson will supply a speedy answer. And occasionally it's "yes," thanks to our expanded output. If the answer is "not yet," we hope you'll keep trying—only a short time may be needed to supply you.

Mathieson has purposely centralized its order, shipping and traffic departments in the main office to give you ready, reliable information. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

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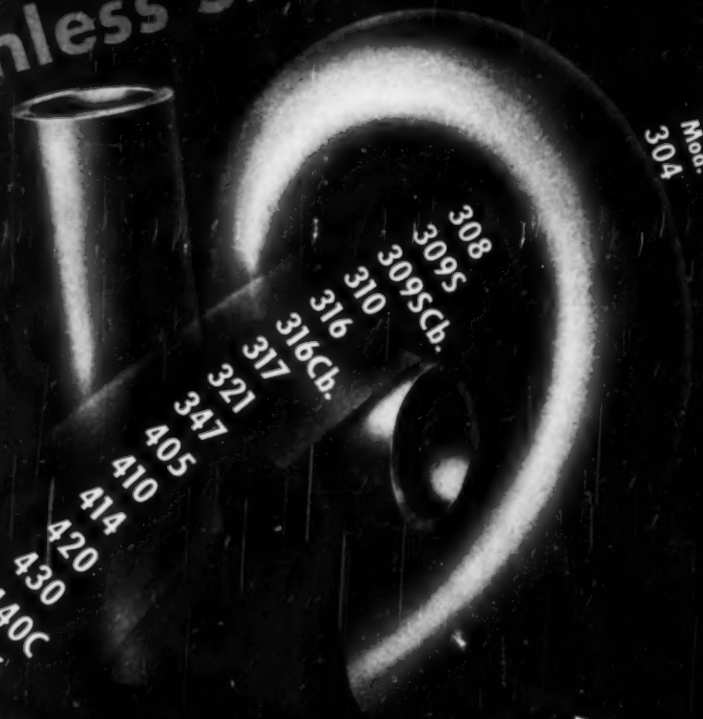
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ESTABLISHED 1892 • PLANTS AT NIAGARA FALLS, N. Y., SALTVILLE, VA., LAKE CHARLES, LA.

B&W can supply you...
SEAMLESS or
WELDED

Stainless Steel Tubing

in



different analyses

...for your corrosive and high temperature services. Write for TDC 122 which contains the composition of all these grades.



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General Offices: Beaver Falls, Pa.
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BABCOCK & WILCOX
SEAMLESS & WELDED **TUBES**

Seamless and Welded Tubular Products in a full range of Carbon, Alloy, and Stainless Steels for All Pressure and Mechanical Applications

-160°F or +1000°F

...There's a

CHAPMAN

STEEL VALVE

for every operating need

Whatever the temperature of fluids or gases, from —160° F. to more than 1000° F., Chapman has a steel valve that has been specifically designed to give trouble-free service.

Every valve in this extensive line is quality-controlled during every step in manufacture from the metals developed and produced in Chapman's own foundries to final shipment to you. And, though manufactured with production line speed and economy, each has the precision rating of custom-made valves—equalling or exceeding standard specifications.

It will pay you to check the Chapman line first before you order. For additional information on Chapman's unusually wide range of sizes and types, write today to:

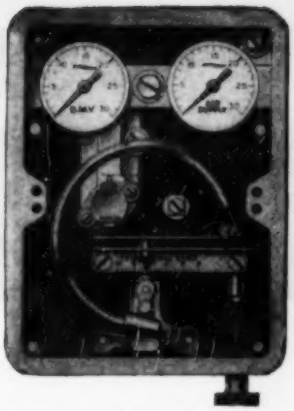


The Chapman Valve Manufacturing Co.

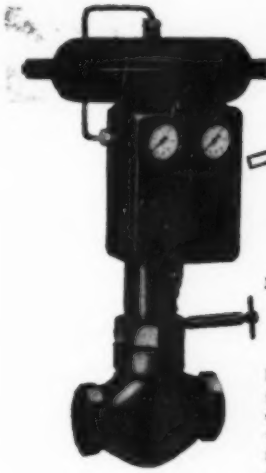
INDIAN ORCHARD, MASS.

FINGER-TIP PRESSURE CONTROL

WITH HAIR-LINE ACCURACY!



This Kieley & Mueller Kontrol Master Pressure Pilot Controls Reducing or Back Pressures to 10.000 p.s.i.



Mounted on the Valve or on the wall.

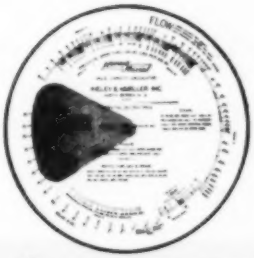
Pressure connection at either back or side.

For high pressure gas service, or steam and liquid service with relatively small flows, type 46V-1850 utilising air or non-corrosive gas as an operating medium.

You adjust Kontrol Master Pressure Pilots to fine pressure settings by simply turning the Vernier screw.

Changes in throttling range of from 1% to 75% of the pilot pressure range are made by moving the small screw in the center of case to desired position on the proportioned band.

And you can change from *direct* to *reverse* action at a moment's notice! Just loosen the two screws that hold the pilot assembly to the manifold block and rotate assembly 180°. This does not disturb bourdon tube or nozzle block.



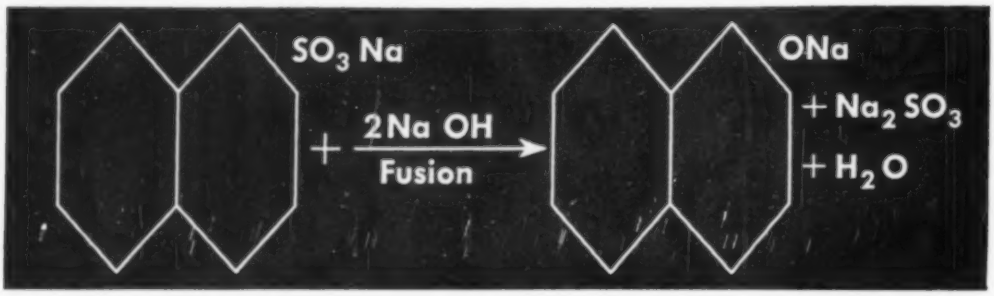
Kieley & Mueller engineers have built plus values into the Kontrol Master Pressure Pilot.

You will appreciate its flexibility of control, its wide range of adjustments and the improved maintenance condition that results from the elimination of small tubing. For specification data, ask for Bulletin 4000.

VALVE CAPACITY CALCULATOR:
Thousands of process industry engineers have found this circular, slide-rule type scale invaluable for calculating valve capacity. Correction scales for steam quality, liquid and gas specific gravity and a flowing temperature scale for gases are included. Send for yours. There is no charge, but please make request on business stationery.

KONTROL MASTER
NORTH BERGEN, N.J.

How to make LONGER-LASTING EQUIPMENT for Anhydrous Caustic Processing



***Nickel* may solve your corrosion problems in caustic fusions or continuous production of anhydrous caustic**

For many years, the chemical industry has regarded Nickel as the *standard* metal for caustic handling equipment.

Pure Nickel, and Inconel*, as well as Lukens Nickel-Clad Steel, offer excellent resistance to the hot alkali, and reduce the possibility of contamination through excessive metal pickup. In addition, these metals are easy to fabricate and can be joined with corrosion resistant welds.

For these reasons, users of caustic fusion processes have followed the lead of caustic soda producers—and turned to Nickel and Inconel* as materials for processing equipment.

Continuous processing, whether to produce anhydrous caustic, or in a caustic fusion process, may make severe demands on equipment. The combination of properties available in Nickel and Inconel recommend them for these continuous units. Both show high corrosion resistance to hot caustic and commonly encountered organic chemicals.

If you are concerned with corrosion problems arising from caustic fusion or continuous anhydrous caustic production—consult our Corrosion Engineering Service. A large fund of up-to-the-minute experience data is yours for the asking.

IMPORTANT NEWS ABOUT INCONEL

As a result of recent investigation, Inconel has proved to be of significant value for certain applications involving hot caustic soda. If you would like full information on these recent findings, write now to our Corrosion Engineering Service.

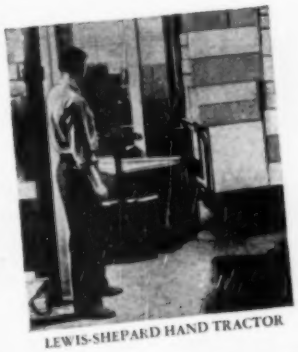
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INCO
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USE PURE Nickel WHERE PURITY COUNTS

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

*Reg. U. S. Pat. Off.



LEWIS-SHEPARD HAND TRACTOR



LEWIS-SHEPARD FORK LIFT TRUCK

Time Savers, Cost Cutters

Battery Electric Trucks and EXIDE-IRONCLAD BATTERIES

Handle materials the modern way . . . the fast, safe, economical way. Use versatile battery electric trucks for loading, unloading, hauling, high tiering. They'll help you speed production, open up bottlenecks, save and earn for you all along the line. When powered by dependable Exide-Ironclad Batteries, you can count on full shift availability day after day, year after year.

Different from all other batteries in construction as well as in performance, the Exide-Ironclad possesses ALL FOUR of the essential characteristics demanded of a battery for electric industrial truck service—(1) high power ability, (2) high efficiency, (3) great ruggedness, and (4) long life. These characteristics are due to the special construction of the Exide-Ironclad Battery, especially its rugged, tubular positive plate.

Write for further particulars and FREE copy of Exide-Ironclad Topics, which covers latest developments in materials handling and shows actual case histories.

1888...DEPENDABLE BATTERIES FOR 61 YEARS...1949

"Exide-Ironclad" Reg. Trade-Mark U. S. Pat. Off.

DEPENDABLE POWER



THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

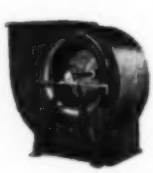
WESTINGHOUSE ANNOUNCES A NEW STURTEVANT FAN... THE MOST EFFICIENT CENTRIFUGAL FAN EVER BUILT



AIR HANDLING UNITS



UNIT HEATERS



CENTRIFUGAL FANS



REFRIGERATION CONDENSERS



Positive new savings for every cubic foot of air moved! *No centrifugal fan has ever been built that will move air with as little power as the new Sturtevant Silentvane.* Efficiencies in excess of 80% are obtained over 37 per cent of the usual application range. *Peak efficiency now reaches 86%.* Check these five outstanding features:

1. **QUIET OPERATION**—because of the streamlined inlet and careful attention to smooth eddy-free air flow.
2. **INHERENT HIGH EFFICIENCY**—because of basic Silentvane design.
3. **TRUE SELF-LIMITING AND NON-OVERLOADING HORSEPOWER CHARACTERISTIC**—at any given speed.
4. **SPEED FLEXIBILITY**—for direct connection or belt drive.
5. **FREEDOM FROM DUST LOADING**—because of flat blade surfaces and fewer blades.

Here is the answer to your heating, air conditioning or industrial ventilating requirements. Call your Sturtevant office, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

Westinghouse
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REFRIGERATION COMPRESSORS



AXIAL FLOW FANS



HEATING AND COOLING COILS



UNIT AIR CONDITIONERS



SURFACE DEHUMIDIFIERS

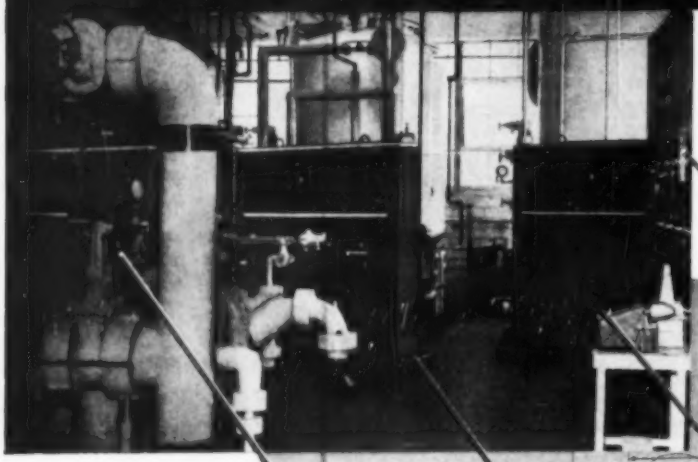


PRECIPITRON* (ELECTRONIC AIR CLEANER)

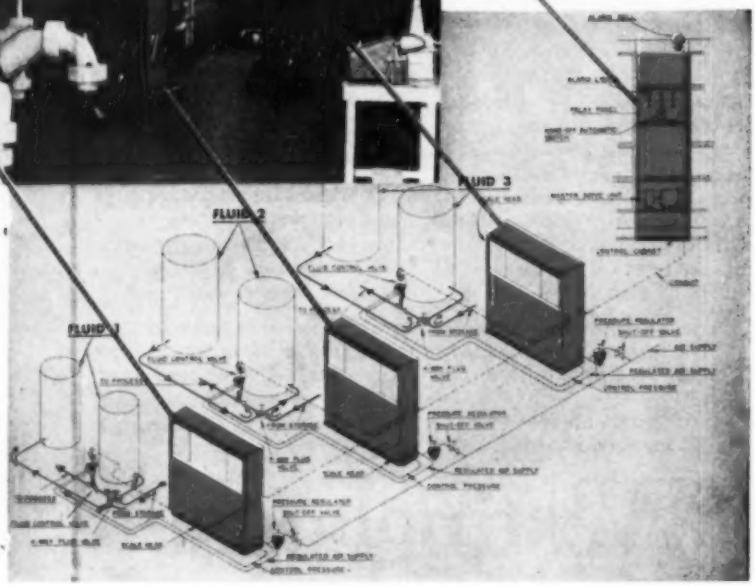
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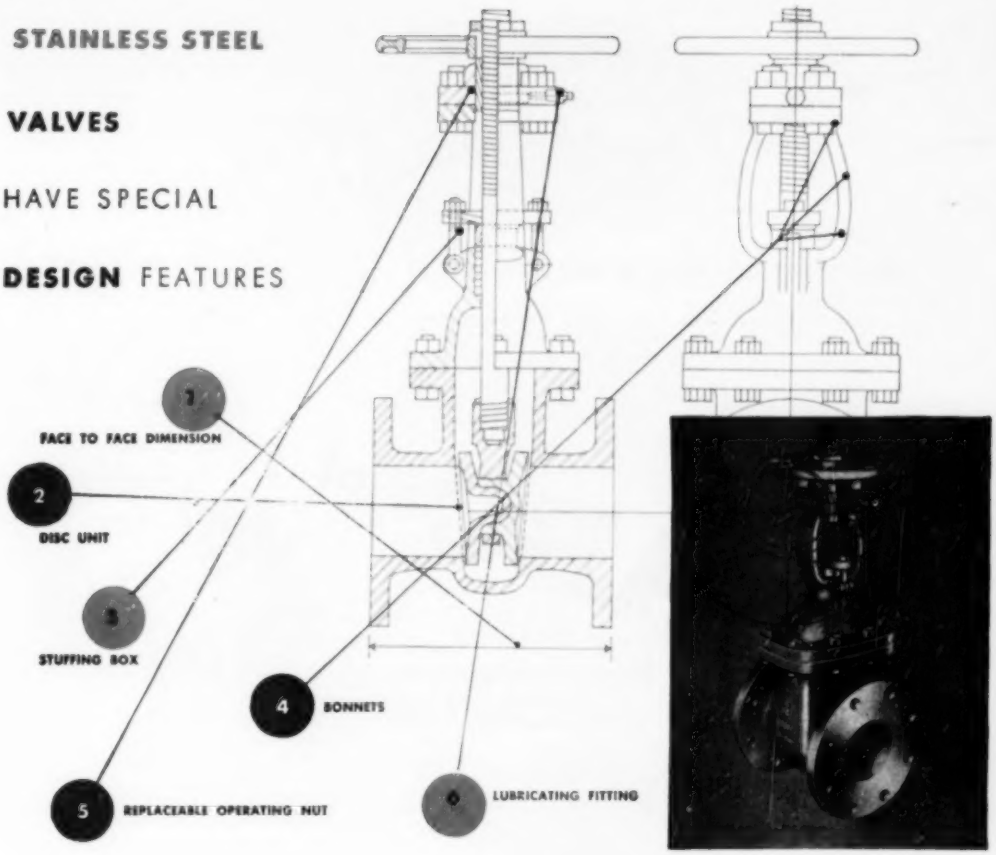
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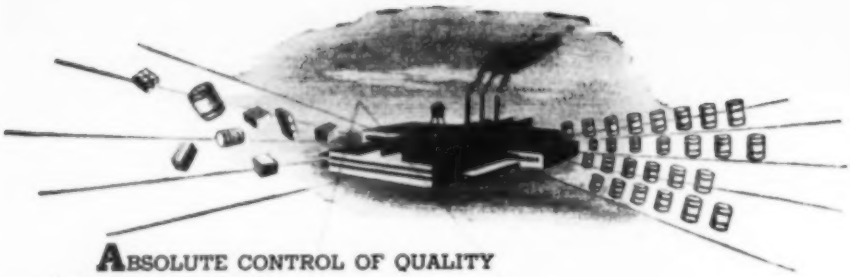
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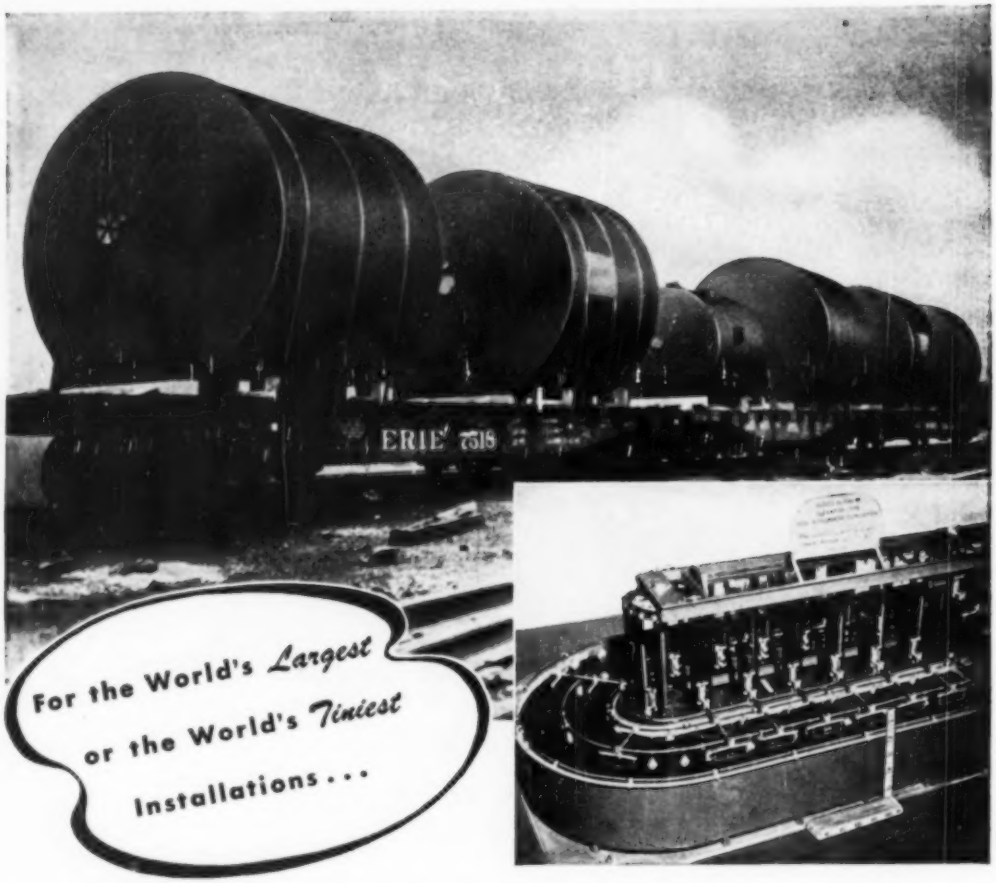
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Engineers choose Manhattan Rubber for Tank Linings

Pictured above are six of a trainload of fifteen tanks, rubber lined by Raybestos-Manhattan, Inc., for the world's largest water conditioning plant. Large quantities of pipe and fittings also were rubber lined by Manhattan for this fully automatic demineralizing and silica removal system.

This equipment will handle water from Lake Huron at atmospheric temperature and purified at a rate of 2,000 gallons per minute. It supplies 1,400 lbs. per square inch to boilers for generating electric power. Belco Industrial Equipment Division of Bogue Electric Manufacturing Co. of Paterson, N. J. engineered and supplied the installation for a big midwest chemical plant.

Inset shows the world's tiniest installation of its kind rubber lined by Manhattan. It is a 40" long scale model, Full Automatic Elevator Type Plating Machine. Hanson, Van Winkle, Munning Company exhibit it at trade shows, to gold plate souvenir charms. It is a dramatic action model of the World's Largest Plating Tank which required seven flat cars to ship when Manhattan Rubber lined it in 1945.

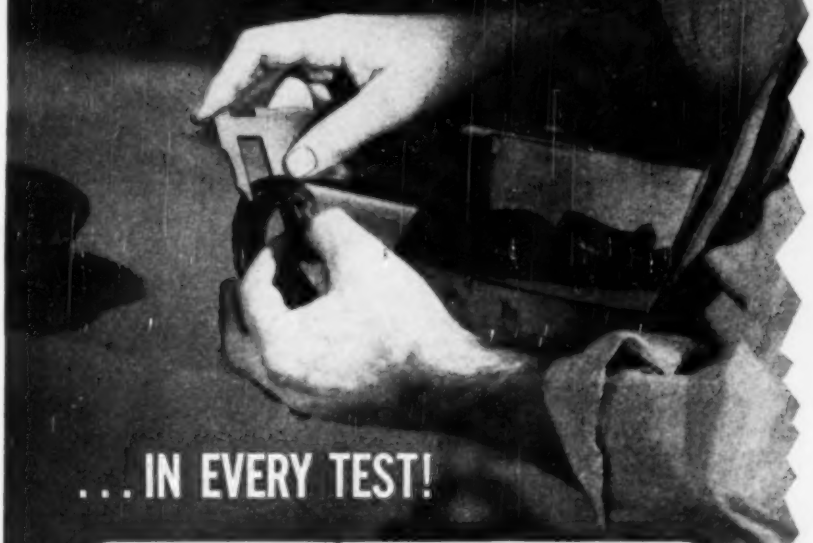
If you have a rubber lining project, it pays to call on Raybestos-Manhattan engineers, whose proved capacity and skill to rubber line the largest and the tiniest of jobs insures safe handling of your equipment.

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That's why more and more engineers are saying — "Let's put the problem up to U. S. Stoneware." They have learned that U. S. Stoneware "engineered protection" is a safeguard against excessive down-time . . . against excessive maintenance costs.

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THE
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COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

Volume 56 | FEBRUARY • 1949 | Number 2

Record exports of U.S. alkalis in 1948 are not likely to be topped in 1949. At the rate alkalis were going abroad during the first six months, the U.S. in 1948 should have exported 403,842,000 lb. of soda ash and 372,772,000 lb. of caustic soda. These figures are at least 40 percent higher than 1939 totals and 30 percent over 1947 figures. These record exports are an aftermath of war, which knocked out capacity in Europe and the Orient. Too, they reflect industrial growth in Latin America.

But the U.S. will have to get off the gravy train. Europe is planning production of alkalis for export. And South Africa, India and Australia are stepping up output. To hurt U.S. alkali exports further is the dollar squeeze abroad: already Argentina and Brazil have made a deal with Britain for alkalis. And the practices of Johnny-come-lately traders, lured by prices as high as 10c. a lb. for soda ash and 25c. a lb. for caustic, who shipped off-quality material defectively packaged, are now to come home to roost.

•

Controlling stream pollution, the big job with which it got saddled by the Water Pollution Control Act of 1948, has brought the reorganization of its sanitary engineering branch by the U.S. Public Health Service. Henceforth, there will be two divisions, one for sanitation and the other for water pollution control. Chief purpose of the Water Pollution Control Division, as directed by the law, is to give financial and technical assistance to the states in formulating and carrying out their stream pollution control programs.

In capsule, here is what the Water Pollution Control Act provides: (1) Congress appropriates funds for grants to aid preparation of plans and loans to assist either planning or construction of treatment works; (2) Federal Works Agency through its Bureau of Community Facilities administers the funds; (3) both the state water pollution control agency and the Surgeon General of USPHS approve the project; and (4) the grant or loan is made. Public Health Service and the Bureau of Community Facilities are now drafting the procedures for obtaining financial assistance.

Under Carl E. Schwob, the now full-fledged Water Pollution Control Division of USPHS takes over 14 river basin offices that will serve the states, interstate agencies, municipalities and industries in their drainage areas. River basin offices already in operation are at Portland, Ore., for the Pacific Northwest, and at Kansas City, for the Missouri River Basin. Others will be located in Boston, New York, Washington, D. C., Atlanta, Cincinnati, St. Louis, Little Rock, Dallas, Boulder City, Nev., and San Francisco (two offices). In addition, the basin engineers can call upon the eight existing district offices of USPHS for technical and other help.

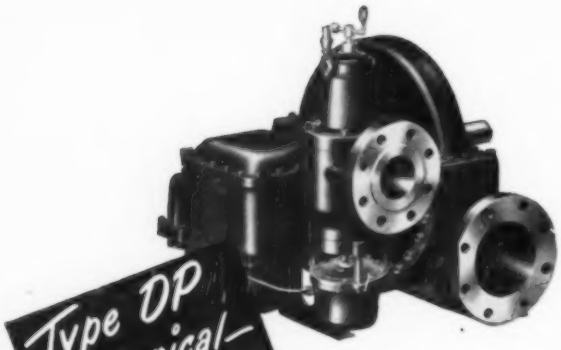
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Wind-up of War Assets Administration, for which the President's budget provides no money after June 30 next, is in prospect. Financing is the last hurdle to be cleared before the WAA turns the alcohol-from-wood plant at Springfield, Ore., over to Wastewood Chemical Co., organized by business interests. Cannibalizing of distilleries and other plants is already under way, and there will be more of it in all of WAA's chemical plants as WAA tries to clean up this year. Cannibalization will be held up as a threat to lessees and operators who are slow in buying. All told, there are about 40 chemical plants to be leased, sold or junked. Among them are plants to produce oxygen, oxides of thorium and cerium, beryllium, manganese concentrates, fluorspar concentrates, chrome ore, zinc, auto tires, aviation gasoline, alcohol, ammonium nitrate, caustic and chlorine, and coal-tar chemicals.

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From the President's budget chemical management can glean ideas of Administration plans to expand or cut back activities of government agencies, as

(*Continued on page 76*)



HERE'S HOW YOU SAVE

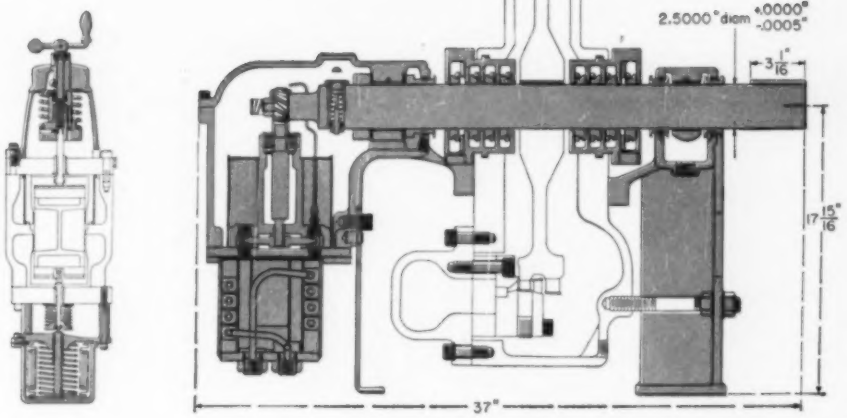
SAVE ON SPARE PARTS because of high degree of interchangeability of the new Type DP line. (Cross-section drawing shows parts interchangeable on all frame sizes.)

You can reduce your spare parts inventory with this standard kit, containing parts applicable to *all* standard Type DP turbines. With this set of packaged spares you save 75% of price of comparable set of loose spares for previous designs.

With the DP you save money on first cost too. Only G.E. offers hydraulic governing (30% adjustable speed range) on a standard turbine — at no extra cost.



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PARTS IN COLOR INTERCHANGEABLE ON ALL FRAME SIZES

SAVE TIME when installing DP turbines or when re-locating them in your plant. (Drawing shows dimensions common to all frame sizes.) Standard shaft height permits you to use a fixed mounting height on all your turbine drives. Standardization of the DP saves time on deliveries too—shipment time is approximately 20 weeks.

When it comes to alignment, you'll appreciate the DP's center-line support — now standardized on all frame sizes. Center-line support eliminates mis-alignment resulting from expansion from normal heating.

SAVE TROUBLE because of superior design features of the new Type DP — features such as: totally enclosed governing system protected in an oil atmosphere against rusting and sticking (particularly a problem on standby units); nonsparking overspeed trip, suitable for explosive atmospheres; new long-life solid-backed bearings; Monel-sprayed shaft at packings to eliminate corrosion; positive pressure lubrication; balanced valve design, and many other improvements to reduce maintenance.

The new Type DP is not a "standard turbine" for a narrow range of ratings only, but a standardized *line*, in ratings from 10 to approximately 1200 hp, speeds from 1000 to 5000 rpm. Thus, if your turbine drives fall within this wide range, you can save money — time — and trouble — by standardizing on the Type DP. For full information get in touch with your G-E representative. ***Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

GENERAL ELECTRIC

(*Continued from page 73*)

well as some inkling of what legislation affecting the process industries is in the wind.

Strategic stockpiling objective now calls for $3.7 billion. By the end of fiscal 1950, $1.6 billion in materials will be on hand, and total for authorizations and materials will have reached $2.3 billion. Expenditures for fiscal 1950: $525 million, compared with $350 million this year.

For the Public Health Service, the budget request is up $8 million over the current year. In part, this is to take care of the program called for by the new federal stream pollution law. Most bureaus in the Agricultural Research Administration find their budgets taken in a notch or two from this year. But the figure for work under the Research and Marketing Act is up to $19 million, from this year's $13.5 million. And if the Patent Office gets enough money to keep its present staff, it hopes to "reduce its backlog to normal by 1954."

Budget language gives equal play to Federal Trade Commissioner Mason's unfair trade practice conference idea and to the anti-monopoly crusade of the other commissioners. Department of Justice winds up with a recommendation that it get as much money to do its trust busting as it got from the Republican 80th Congress, but no more.

For a National Science Foundation, there is a request for $3 million and for an authorization of $12.5 million to initiate the Foundation's program in 1950-51. If there is to be a St. Lawrence seaway, President Truman thinks about $8 million would be expended on it in fiscal 1950. Calling for expenditures of $1 million for organization and planning, the budget message speaks of "legislation that would create a new business-type enterprise for the commercial production of synthetic fuels."

•

Burial of the Parker report, which recommended wider industrial participation in atomic energy, was adroitly maneuvered by the Atomic Energy Commission. AEC almost succeeded in hiding the release of the Parker report, containing findings of an Industry Advisory Committee, under a bushel.

First, AEC rushed out two other releases announcing a Du Pont and a Westinghouse contract, the latter still only in the letter of intent stage, to make it appear as though AEC were pulling industry more into the atomic picture. Next, the Parker report was timed to come out during the holiday rush — but not before AEC found time to prepare a five-page reply. This reply credited AEC with having already done a number of things that, superficially at least, appear in line with recommendations in the Parker report. Finally, the press conference called to give AEC's reaction to the report was sidetracked with the "scarehead" story of how AEC saved the day back in 1946, when plutonium production at Hanford might have stopped, had not the AEC concentrated on reconstruction of the plant. Result, of course, was that the committee report became the tag end of most newspaper stories. To say the least, Chairman Lilienthal did little to give reporters the proper perspective.

But the report is well worth going over. Its basic premise is that the tempo of atomic development will be quickened if AEC opens its doors, as wide as security allows, to industry. The Parker report program: discontinue AEC's policy of assigning specified problems to individual "hired-hand" contractors; instead, turn ingenuity, stropped razor keen by competition, loose on the bristling problems of industrial atomics.

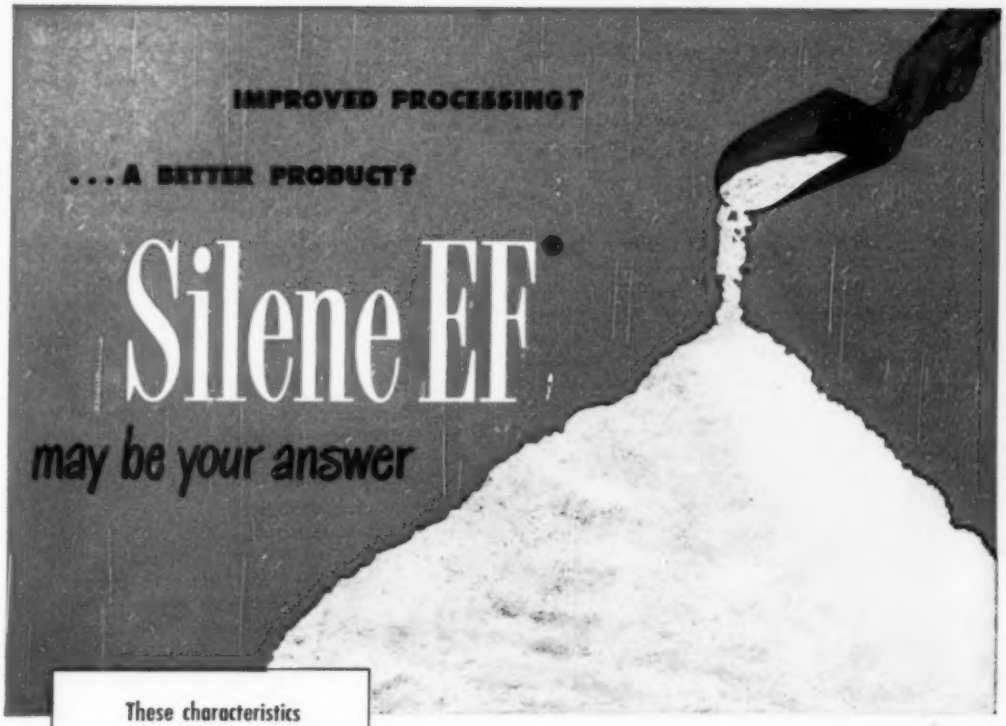
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AEC's revamped personnel program bears watching. Cashing in on Section 12 (a) (4) of the Atomic Energy Act, AEC is setting up its own personnel policy for its 500 employees in Washington and 4,500 in the field. Section 12 (a) (4) permits AEC, to the extent it deems such action necessary, to hire and pay employees without regard to the civil service laws or the Federal Classification Act of 1923 as amended.

AEC will not be hamstrung by rigid civil service rules. In salaries and wages it will be able to compete with its 350 contractors for scarce scientific and technical workers, as well as for laborers and skilled craftsmen. AEC hopes to maintain a competitive position nationally as to scientists and in the local labor markets as to laborers and mechanics. Other AEC employees will get the regular government pay. By matching the pay of private industry while, at the same time, continuing the vacation, sick leave, retirement and other benefits given government workers, AEC may be building up an advantage over the private contractors, who employ about 63,000 on AEC work. But at last the AEC, whose baby is the atom bomb, has this ace up its sleeve: it can now pay the salaries and wages to attract and keep the scientists and technicians it needs.

•

Output of essential U-235 is to be increased. AEC has earmarked $70 million for adding even greater capacity to Oak Ridge's 160-acre gaseous diffusion plant. Gaseous diffusion equipment consists primarily of a series of screens (reportedly nickel-



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Silene EF is a white, very finely divided, precipitated hydrated calcium silicate with the following approximate analysis:

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Loss on Ignition	16.5
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This unique Columbia product has proved its value in the following established uses:

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Anti-caking agent
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Throughout the war, Silene EF was used predominantly by the rubber industry and continues to be in increasing demand in this field. Expanded production is now providing additional volumes of Silene EF for other uses. If you are interested in exploring the possibilities which Silene EF may afford your products, you can obtain comprehensive data accumulated on the performance of this material in rubber, plastics and other uses. Samples for experimental purposes are also available. Write to Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth at Bellefield, Pittsburgh 13, Pa.

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PITTSBURGH PLATE GLASS COMPANY

plated) through which the hexafluoride of U-235 passes slightly more readily than that of its much more stable isotope, U-238. Right now, Giffels & Vallet, Inc., Detroit engineers, are drawing up detailed plans. Construction is slated to start in six months.

•

Role of hydrogen peroxide in a future filled with guided missiles, rockets and even space ships, not to mention submarines, is going to be of paramount importance. That is why Buffalo Electro-Chemical plans to put up a new peroxide unit. Its probable location: a 46-acre site at Vancouver, Wash., where even now Buffalo Electro-Chemical is dickering for 2,500 kw. of interruptible power. Eventually the plant will gobble up 10,000 kw., but the power-short Northwest cannot spare that much until new generators are installed. Anyway, it will be at least two years before the plant is ready to use 10,000 kw. Meanwhile, the big brass and topside goldbraid are anxiously eyeing the output of hydrogen peroxide.

•

Airborne fluorine and fluorides are a menace that government and industry are going after. Next June, when a $200,000 fluorine recovery unit at TVA's Godwin phosphate sintering plant is completed, gases will be drawn through a limestone-packed tower. Each day, fresh limestone will be loaded at the top, and, from the base of the tower, calcium fluoride withdrawn. Calcium fluoride sales will pay for the system and net a small profit. TVA is offering the process to enterprising phosphate makers. And at its Columbia phosphorus plant Monsanto is putting in a washing unit to rid smoke of fluorine gas. Cost, including research and development, will reach $750,000. Sintering plant gases will be scrubbed with a liquid spray that absorbs fluorine. Another process will then neutralize the fluorine in the resulting liquid. Nor has the aluminum industry been caught napping. At Vancouver, Wash., Alcoa is installing at a cost of more than $1 million a new process to trap fluorides. Hoods over reduction pots will collect fluoride fumes. Fluorides will be removed in washing towers. Upkeep will cost $100,000 a year.

•

Intermountain fertilizer industry is a natural. The region has a lion's share of U. S. phosphate rock reserves, plenty of potash and a burgeoning market. In the West, the fertilizer industry idea is snowballing. Much has happened since 1945, when Simplot Fertilizer Co. pioneered the area's first single superphosphate plant at Pocatello, Idaho (since greatly expanded). At Pocatello too, Westvaco's first $4 million electric furnace, begun last year, is due to be turning out elemental phosphorus in April. To tie in, Simplot will make triple superphosphate. Up in Montana, meantime, Anaconda Copper Mining Co. is doubling its capacity for phosphoric acid and high-strength phosphate fertilizers. Soon to be completed is the concentrated superphosphate plant of Gem State Phosphate Co. at Wendall, Idaho. And now comes Westvaco with word that construction of its second furnace—to turn out 30 tons of elemental phosphorus a day—will start as soon as the first is completed.

The Intermountain area is staking out an ambitious claim in agricultural chemicals. There is talk of another triple superphosphate plant in Idaho, of anhydrous ammonia production in Wyoming or Utah, of ammonium phosphate fertilizer to be made in Salt Lake City and of two elemental sulphur plants to go up in Wyoming. When Garfield Chemical & Manufacturing Co. in Utah completes its $6.5 million expansion of sulphuric acid capacity, it will have one of the bigger acid plants in the U. S. Afoot too is a project for making chemical-grade sodium phosphates—then potassium phosphates—at Westvaco's new soda ash plant in Wyoming (for the big *if* in the future of this plant, see *Chementator*, Jan. 1949, p. 67).

In the next few years, many of these projects will gel. This much is certain: the Intermountain area has large-to-ample reserves of basic chemical raw materials—phosphate rock, trona, potash, salt, coal, sulphur, limestone, natural gas and petroleum—that will be tapped more and more within the next decade. The area's greatest needs: more water (in the right places), more and cheaper power, improved access to major markets and a decision from Congress on the basing point problem.

•

Magnesium bisulphite pulping, which eliminates stream pollution, is an up-and-coming process. Already, Soundview Pulp Co. is planning to install the process, which uses magnesium oxide as the base for the cooking acid, at its Everett, Wash., sulphite mill. Estimated cost: up to $5 million. Construction probably will start in six to nine months, soon after Weyerhaeuser at its Longview, Wash., mill works the last few bugs out of magnesia-base pulping.

•

Competitors in cellophane production are sought by Du Pont. Du Pont was all set to go ahead with a major plant expansion program in cellophane when the Department of Justice swung its monopoly meat axe, charging control of patents and price fixing. Stung by the Department of Justice charges, Du Pont now offers free patents, loan of technical



As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire. The unit operates a Ruggles-Coles Dryer, built by the Hardinge Co., Inc., York, Pa.

SPEEDAIRE ... for 3 years 24 hours a day

THREE years ago, a South Carolina kaolin plant installed one of Cleveland's new fan-cooled Speedaire worm gear speed reducers to drive a rotary kiln. It has operated almost continuously, day and night, ever since, with unimpaired efficiency in spite of the heat and dust.

As the photograph indicates, a limited area was available to install a speed reducer, but it was entirely adequate for Speedaire, because it occupies 42% less space than a conventional worm gear drive of comparable capacity. Speedaire also saved $128.50 on initial cost.

Because Speedaire is fan-cooled, it will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 5273 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.
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CLEVELAND
Worm Gear
Speed Reducers

men, engineering data and a plant site at cost to prospective competitors. Of those who have nibbled, Olin Industries is the most tempted, with W. R. Grace & Co. next. Freeport Sulphur's interest has waned. Minimum capital required: $20 million.

Cellophane's price history has been one of DuPont's proudest boasts, having dropped from $2.65 a lb. when introduced in 1924 to 33c. a lb. Back up now, ordinary cellophane sells for 45c. a lb. and the moistureproof, once 41c. a lb., for 47c. Moistureproof now makes up the largest volume of production. Output of cellophane is now running at about 175 million pounds a year or better, and demand is expected to go up from 10 to 20 percent in the next few years. Annual sales of cellophane are about $65 million, with 75 percent going to Du Pont (its only present rival: American Viscose).

Du Pont has been trying to duck monopoly charges in other fields. It has licensed National Distillers to produce metallic sodium, essential ingredient in the manufacture of tetraethyl lead (see *Chementator*, Jan. 1949, p. 72). And there is talk, too, that Du Pont might not oppose licenses to make nylon. But, with its own new nylon plant at Victoria, Tex., going up, this seems unlikely at present.

•

More organic chemicals will be coming from the Chemcel plant of Celanese at Bishop, Tex., this year as the plant is further expanded. Celanese plans a large production program for derivatives of formaldehyde. For this purpose, new process equipment will be installed. Chemical newcomers to the Celanese line to be marketed commercially include propionaldehyde (made last year in drum quantities), *n*-butanol and iso-butanol. Last year Celanese entered the glycol field with the production of 2-methyl 1,3-pentanediol.

•

Organics from the Oxo process now include derivatives other than the higher alcohols (see *Chementator*, Nov. 1948, p. 80). Rohm & Haas is now operating a pilot plant to produce aldehydes catalytically by the Oxo process from olefins, carbon monoxide and hydrogen. Other organic chemicals, in turn, are derived from the aldehydes. Right now, Rohm & Haas is exploring the market for six new chemicals. Plant construction and commercial production may not be far off.

Unlike most olefins, diisobutylene, the Rohm & Haas raw material, reacts with carbon monoxide and hydrogen to give only one isomer. The carbonyl group attaches to the terminal carbon, and the product is 3,5,5-trimethyl hexaldehyde. From this nonyl aldehyde Rohm & Haas derives the six chemicals it is now making available: nonanoic acid, nonylamine, nonyl aldehyde cyanohydrin, alpha-hydroxydecanoic acid, octadecenyl aldehyde and octadecyl alcohol.

Heavy metal salts of nonanoic acid can be used as paint driers and gelling agents. The copper salt has fungicidal possibilities. Vinyl and allyl esters of nonanoic acid can be polymerized; esters with higher alcohols, glycols and glycol ethers hold promise for plasticizers and synthetic lubricants. Nonanoic acid can be used to modify non-drying alkyds. Useful intermediate for introducing an oil-soluble amino group in the synthesis of detergents, rubber chemicals, oil additives and corrosion inhibitors is nonylamine. Nonylamine or its hydrochloride can be used as a cationic flotation agent. Octadecyl alcohol has interest as a lubricant for metal cutting and plastics molding, a softener and lubricant for textiles, an anti-foaming agent, a plasticizer and a solvent. Sodium octadecyl sulphate is surface-active. Other octadecyl alcohol derivatives have possible applications as plasticizers, wetting agents, polymers, oil additives, flotation agents, synthetic lubricants, solvents and textile chemicals.

Nonyl aldehyde cyanohydrin and alpha-hydroxydecanoic acid may be converted to amides, esters, amino acids, diamines and phenolic ketones. These compounds have possible applications as plasticizers, pharmaceuticals, dye intermediates, rubber chemicals, oil additives, synthetic resins, corrosion inhibitors, photographic chemicals and insecticides. Alpha-hydroxydecanoic acid is a promising modifier for zein, not only for plasticizing the protein but also as a homogenizer and for improving zein films. Octadecyl aldehyde, derived from octadecenyl aldehyde, is a versatile intermediate. And octadecylamine and its salts have possibilities as cationic surface-active agents. The Schiff's bases from octadecenyl aldehyde and aromatic primary amines may be effective rubber accelerators and antioxidants. Also feasible is preparation of synthetic drying oils.

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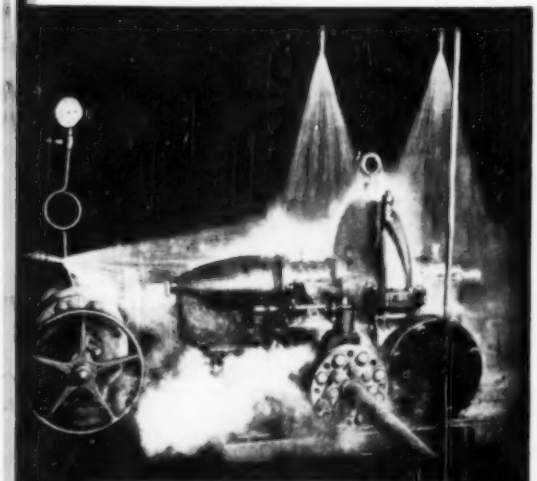
Polyvinyl alcohol production is to be stepped up by Du Pont. To expand capacity at Niagara Falls, Du Pont will shell out $3 million. In about two years, when the job is completed, polyvinyl alcohols will be produced by a continuous process. Du Pont now makes these solid alcohols in batches.

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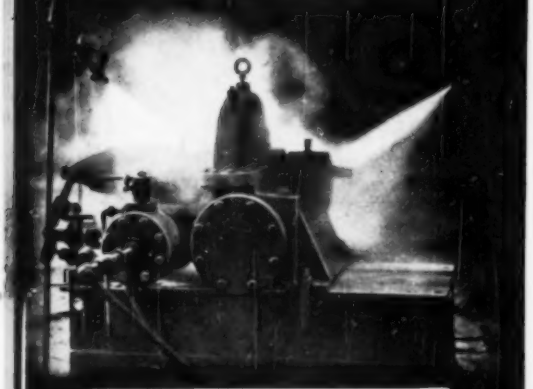
Its output of phenol is being stepped up by Dow. New facilities at Dow's Midland, Mich., plant have added 30 million pounds a year to production capacity for phenol.

For RUGGEDNESS, RELIABILITY and ECONOMY

Count on TYPE E General Purpose Turbines



Water-test periods running for hours and hours—with turbine *operating* and *standing still*—prove the effectiveness of Type E bearing seals against water contamination of lubricating oil.



Dust-like, hard abrasive sprayed on the Type E operating at full speed . . . none of the abrasive entered the bearing housing—governing and overspeed mechanisms operated freely.

Type E turbines can "take it" under the most adverse conditions . . . in wet or dry locations, outdoors in any kind of weather, in subbasements . . . or anywhere that "the going is tough!"

Superior features which make the Type E *outstanding* are weatherproof bearing seals, corrosion-resisting gland zones, centerline support, dual-protection against overspeed, floating movement of governing and trip linkages, and parts interchangeability. These features minimize maintenance time and cost where Type E turbines are applied. Such features also assure dependable performance in continuous or "stand-by" operation.

Here's how ruggedness, reliability and economy are represented in* Type E *turbines!

RUGGEDNESS . . . The strong and sturdy appearance of the Type E exterior is characteristic of *all* parts that must withstand severe service for years.

RELIABILITY . . . Very special care, skill and experience are employed in the design and construction of Type E turbines to assure outstanding performance for long periods of continuous operation . . . or *instant* service when required as a "stand-by" unit.

ECONOMY . . . The Type E is carefully designed to provide for *maximum conversion* of heat energy into horsepower. For most economical selection, a variety of wheel sizes is available. This is particularly advantageous in plants where a number of turbines are required for different locations, and it is desirable to standardize on a single make. Interchangeability of parts between wheel sizes furthers this advantage.

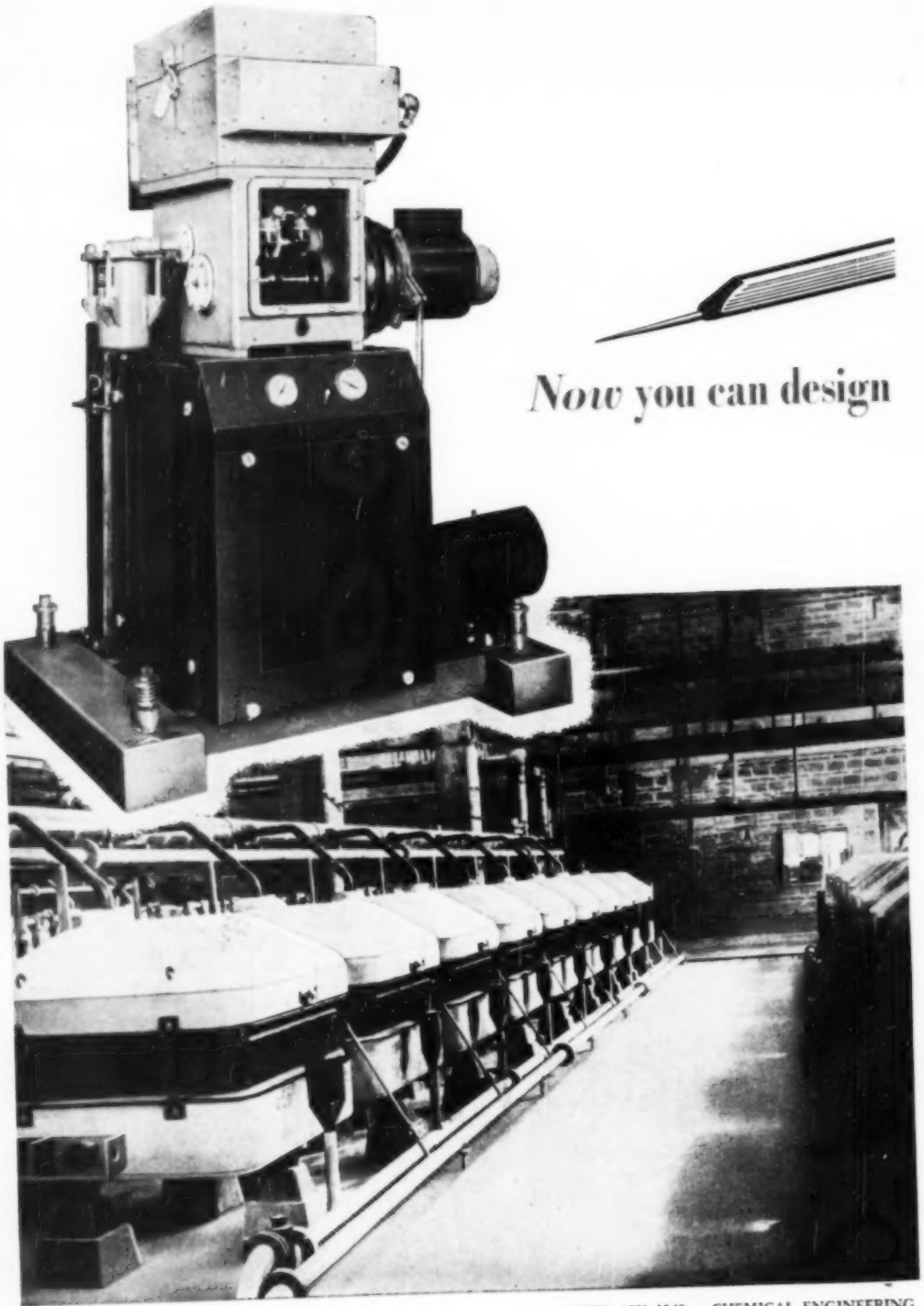
Get all the facts. Call your Westinghouse representative . . . or write for Booklet B-3896 . . . Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-50495

YOU CAN BE SURE . . . IF IT'S Westinghouse

Westinghouse Steam Headquarters

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



Now you can design



your Cell Rooms the way you want them!

• A new mechanical rectifier is now available to give you the necessary high efficiency (96%) in the low voltage ranges you want—100 V. to 400 V. d-c. This new I-T-E rectifier is available in single units up to 10,000 amperes . . . and its operation is based on a principle which has been proved by years of operation under extreme wartime conditions.

NOTE THESE ADVANTAGES . . .

and consider what they mean in dollar savings to your business.

1. **96% efficiency**
2. **Small space required**
3. **Light weight**
4. **No special foundation needed**
5. **Instant availability for service**
6. **Low short circuit current**
7. **Simple voltage control**
8. **Utilizes simple transformer**
9. **Automatic operation**
10. **Multiphase operation**

Get the Complete Story

For complete technical information on the I-T-E Mechanical Rectifier, including a detailed presentation of operation principles, send for Bulletin 4809. The I-T-E representative in your locality will be glad to advise you on adapting the I-T-E mechanical Rectifier to your specific needs. Consult him without obligation.

I-T-E

MECHANICAL RECTIFIERS

The Leader In Technical Excellence

I-T-E CIRCUIT BREAKER COMPANY, 19th & HAMILTON STREETS, PHILADELPHIA 30, PA.
31 OFFICES IN UNITED STATES • In Canada, EASTERN POWER DEVICES, Ltd., TORONTO

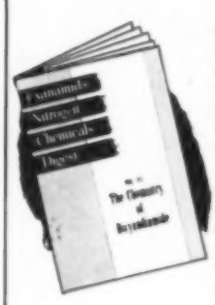
SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES
AUTOMATIC RECLOSING CIRCUIT BREAKERS • MECHANICAL RECTIFIERS

Life ...on the



GOOD FEEDING is a matter of good soil from which the feed must come. That's why phosphorous-rich soils produce better crops and provide better pastures to nourish animals. And to make available in the soil a continuous supply of phosphorous in its most natural form, Cyanamid's AERO-PHOS* Florida Natural Phosphate is used. One application mixed with, or spread over the soil, continues to provide phosphorous to increase the quality and quantity of crops for several years. Hence it is recognized as a long-term soil-builder.

HEAVY WORK requires heavy-duty motors, lubricated by heavy-duty oils. To "fit the oil to the job", Cyanamid has developed a complete line of AEROLUBE* additives, each specially adapted to give the oil the specific qualities required of it as a motor lubricant. Oil stability, engine cleanliness and inhibition of bearing corrosion are three of the qualities which AEROLUBE additives bring to regular, premium and heavy duty motor oils.



AERO† DICYANDIAMIDE has long been an important tool in chemical synthesis. Vol. III of Cyanamid's Nitrogen Chemicals Digest has been prepared as a handy reference booklet covering the physical properties, chemical reactions and suggested uses of this valuable intermediate. This booklet will be an asset to any library on nitrogen chemistry. All information is tabulated in convenient form. Just fill in and return the coupon opposite to receive a free copy of this new booklet.



Chemical Newsfront







STEARATES PLAY A PART in many diverse manufacturing processes — to facilitate the process itself or to produce a better product. Hence, uniformity and purity of stearates can be a big factor in determining the quality of the finished product.

That lead pencil in the little girl's hand *(at left)*, as well as the paint used on the globe beside her and the varnish on her highchair . . . the rockwool "bat" which the worker in the second picture is laying . . . the powder on milady's face, the plastic appointments on her dressing table—the manufacture of each of these probably incorporates one or another of the metallic soaps to improve the finished products.

Because Cyanamid's AERO† Brand Metallic Soaps are produced in extremely small, uniform particles, they are ideally suited to modern manufacturing methods. Indeed, many new uses lie ahead for these versatile materials, particularly where lubrication, water-proofing, suspension, dispersion, flatting and gelling are factors.

*Reg. U. S. Pat. Off. †Trade Mark

WRITE FOR LITERATURE. If you would like further information on products mentioned, check off below and mail.

- ☐ AERO-PHOS Florida Natural Phosphate
- ☐ AEROLUBE Additives
- ☐ AERO Brand Metallic Soaps
- ☐ Dicyandiamide Booklet

Name_____

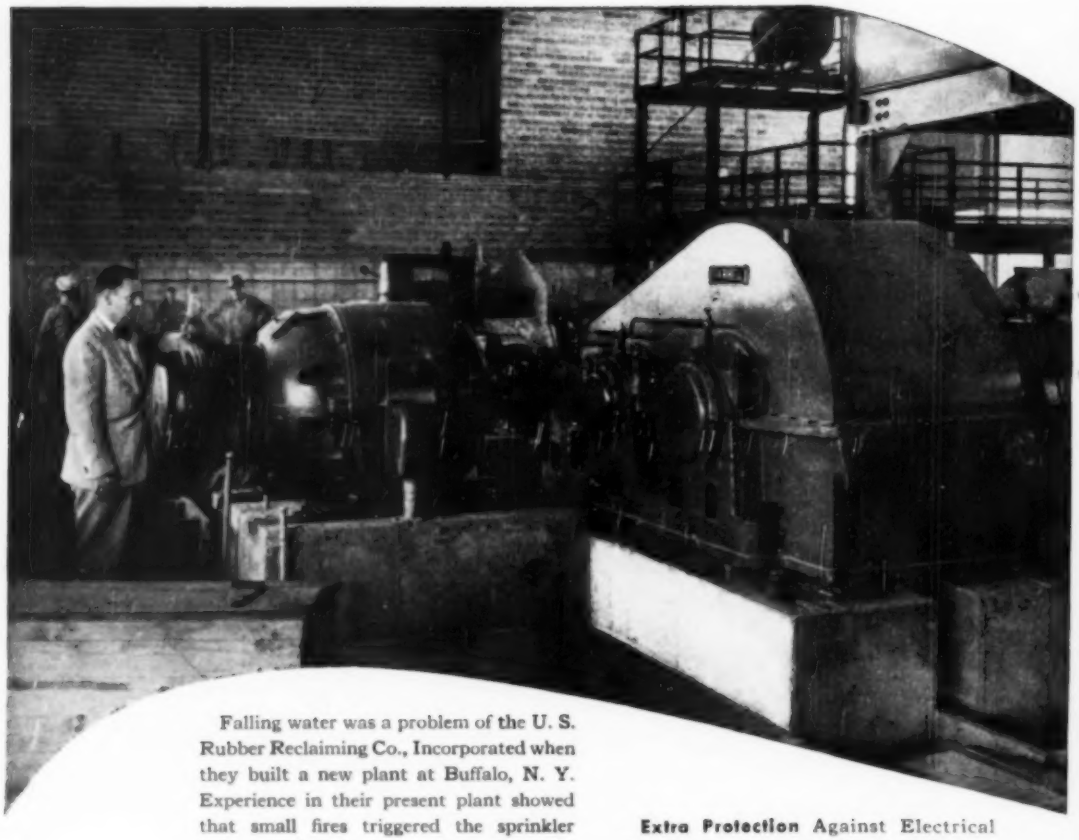
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C E 2-49

AMERICAN Cyanamid COMPANY

30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.



Falling water was a problem of the U. S. Rubber Reclaiming Co., Incorporated when they built a new plant at Buffalo, N. Y. Experience in their present plant showed that small fires triggered the sprinkler system and made motors inoperative. In planning the new plant, the need for motors shielded against falling water was recognized. Also, insurance officials required greater motor protection in the new plant—a need that was filled by Tri-Clad high-speed synchronous motors. Now, no production time is lost because of water in motors.

Dripproof construction with no direct openings above the centerline excludes falling water, dirt, and falling objects. Besides this, there are three extra protections that make Tri-Clad synchronous motors last longer.

Extra Protection Against Physical Damage—sturdy, rigid frames and end shields for protection against corrosion, accidental blows, and falling objects.

Extra Protection Against Electrical Breakdown—proved synthetic bonding and insulating compounds protect coils from heat aging, moisture, mild acids and alkalies. Insure longer life.

Extra Protection Against Operating Wear and Tear—redesigned bearings and bearing housings insure a permanent supply of cool, clean oil from sealed reservoirs.

Delivery on Tri-Clad high-speed synchronous motors and generators is good. Motors are available in ratings from 20 to 1500 hp at 1800 rpm speeds with proportionate hp ratings at speeds through 514 rpm. Generators from 1½ to 1250 kva. For application engineering and delivery data, call your nearest G-E sales representative today. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

770-2

Can a "Sprinkle" Stop Your Plant?

Tri-Clad synchronous motors and generators stay on the job when water falls.

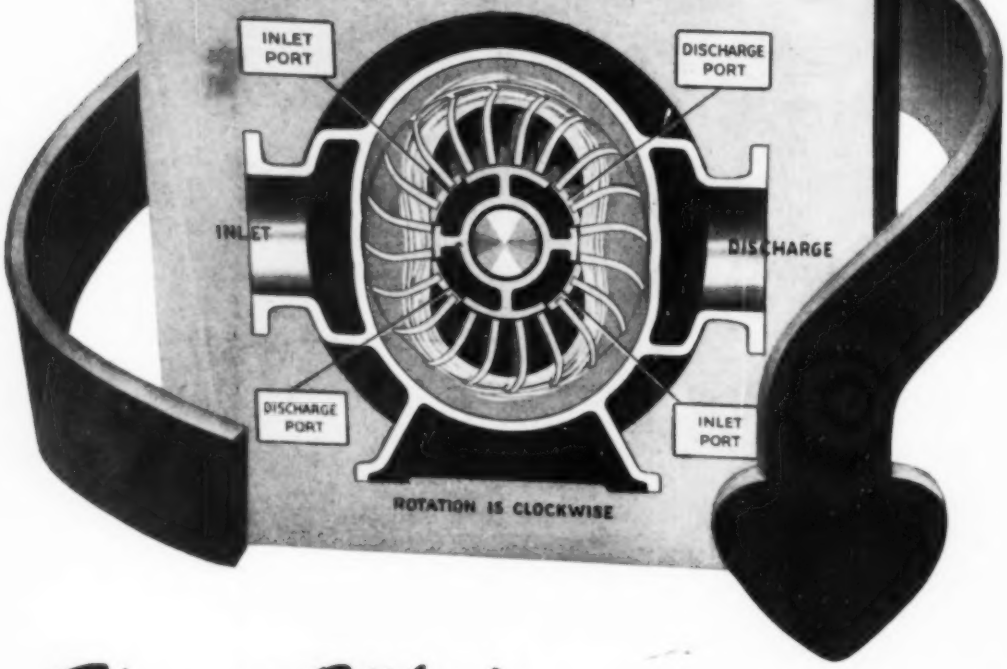


Write today!

2 DESCRIPTIVE BULLETINS

Two new bulletins describing Tri-Clad high-speed synchronous motors and generators are available now. Ask for GEA-5113, Tri-Clad High-Speed Synchronous Motors, and GEA-5125, Tri-Clad High-Speed Synchronous Generators. Get the full story on the protection value of this new line of motors and generators.

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



Here is Why!

You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

No oil filters.
No dust filters.
No internal lubrication to contaminate air handled.
No internal wearing parts.
No valves, pistons, or vanes.
Non-pulsating pressure.
Original performance constant over a long pump life.
Low maintenance cost.

NASH ENGINEERING COMPANY
373 WILSON, SO. NORWALK, CONN.

FOR HIGH PRODUCTION

of filterable slurries . . . four sizes of the new

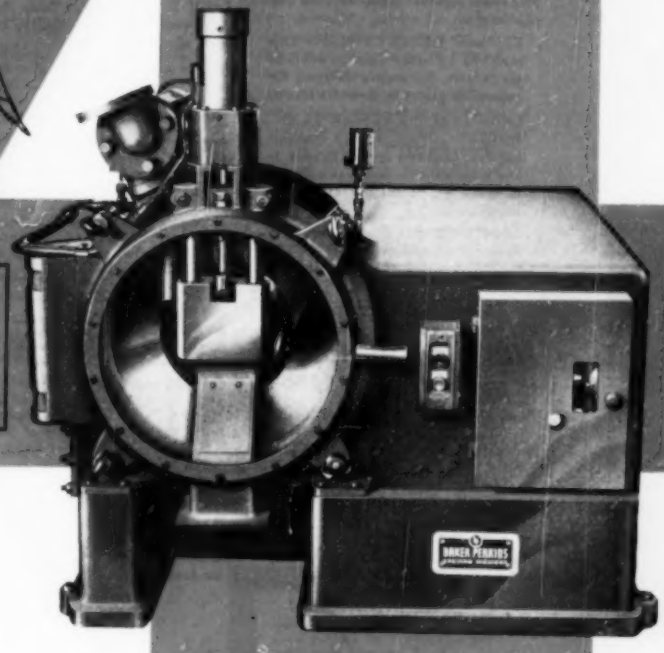
BAKER PERKINS type H for Meer Centrifugals

● Now available for production — as well as the laboratory — are four sizes of the new Type H for Meer Centrifugal for high production of filterable materials. Continuous and completely automatic, these centrifugals may be operated on cycles of from 20 seconds to 30 minutes, depending on the nature of the product being centrifuged. Free draining crystalline material frequently can be handled at a rate from 5 to 700 cu. ft. of solids per hour.

● An important feature of these continuous ter Meer Centrifugals is the wide range of retention time, making them adaptable to many types of materials from free draining crystalline to finest filterable solids. Totally enclosed, vapor-tight construction is available to prevent escape of solvents. Standard models are constructed of stainless steel, special models made of suitable metal to meet particular requirements. Write for complete information.



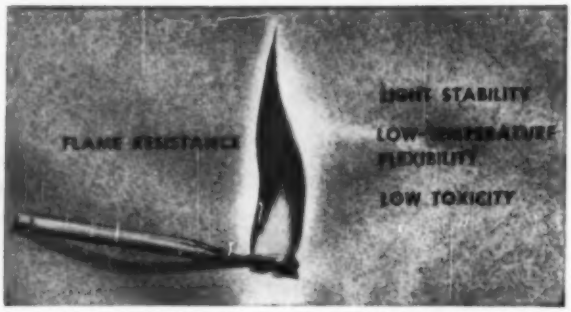
Size Centrifugal	Capacities cu. ft. per hour	Horsepower required	Net Weight
H-18	5-40	3	2,000 lbs.
H-24	25-180	7½	4,500 lbs.
H-36	75-500	15	7,000 lbs.
H-54	250-700	30	18,000 lbs.



BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION, SAGINAW, MICHIGAN

FOR YOUR INFORMATION



Vinyl films plasticized with Santicizer 141 help prevent fires caused by accident or carelessness.

Large-scale production of SANTICIZER 141, fire-resistant plasticizer for vinyl films

New production facilities assure ample supplies of Santicizer* 141. This new Monsanto product combines into one plasticizer:

FLAME RESISTANCE—Unmatched by other equally efficient plasticizers. Eliminates the need for expensive pigment fire-retardants.

LOW-TEMPERATURE FLEXIBILITY—Vinyl articles containing this plasticizer remain flexible at low temperatures. Equal or superior to the most commonly used vinyl plasticizers.

LIGHT STABILITY—Plasticized vinyl compositions age 25-50% longer. Flexibility and color are retained without embrittlement or tackiness.

LOW TOXICITY—Tests show Santicizer 141 to be one of the least toxic of all plasticizers.

Shipment can be made immediately in tank car, drum car or LCL lots.

Send for this free booklet



If you are interested in processing fire-resistant polyvinyl chloride films, ask for a copy of "Santicizer 141 . . . the SAFE Plasticizer." Liberally illustrated, it contains full descriptive and technical data.

INCREASED PRODUCTION OF THESE BASIC MONSANTO CHEMICALS

You can now direct your research toward the development and manufacture of products requiring Phthalic, Maleic, Succinic Anhydrides and Benthal. These basic Monsanto chemicals are now in more ample supply for recognized applications, as well as for any new developments you may be contemplating . . . Technical advice, samples and prices will be furnished on request.

PHTHALIC ANHYDRIDE . . . Used as an intermediate in the manufacture of alkyd resins for paints, varnishes, enamels and other finishes; as a basic material in the manufacture of phthalate esters and dyestuffs.

MALEIC ANHYDRIDE . . . Used alone or in combination with other acids in the manufacture of alkyd-type resins, esters, plastics and for the treatment of oils.

SUCCINIC ANHYDRIDE . . . Now for the first time in volume production, this dibasic acid is used in the manufacture of fine chemicals and pharmaceuticals, esters, resins.

BENTHAL* . . . A monobasic acid designed for the resin industry. The replacement of a portion of the dibasic acid with Benthal in alkyd resins will retard the bodying and permit longer processing time in order to reduce the acid value of the product. Benthal becomes part of the resin molecule and acts as an internal plasticizer—improving flexibility and adhesion.

New Germicide . . . SANTOPHEN 1

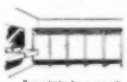
POWERFUL . . . ECONOMICAL . . . AVAILABLE

Santophen* 1 (Monsanto's o-Benzyl-p-Chlorophenol, Technical) has the following important advantages:

Highly toxic to bacteria and fungi • non-irritating when properly formulated • non-staining • non-corrosive to most metals • nearly colorless • faint, agreeable odor • comes as easy-to-handle flaked solid.

In proper formulations, Santophen 1 is useful for a wide variety of germicidal applications, some of which are shown at the right . . . It is now available from Monsanto in commercial quantities. For additional information, technical data and suggested formulations, send for a copy of Monsanto Technical Bulletin O-51, "Santophen 1 for Use in Disinfectants."

Some typical uses for Santophen 1



Sanitizing rest rooms and locker rooms



Disinfecting poultry and livestock shelters



Disinfecting hospital floors, walls and equipment



Controlling athlete's foot around swimming pools



Untreated water



Santomerse 30-X added

WET PROCESSING

Santomerse 30-X for textiles

A new, low-cost, high-efficiency **liquid** synthetic detergent and wetting agent of the alkyl aryl sulfonate type is now available from Monsanto. Known as Santomerse* 30-X, it is designed to provide quick and effective results at minimum cost.

Santomerse 30-X is particularly useful in processing textiles — where wetting, penetration and dispersion are important . . . Its attractive color, viscosity and high detergent value also make it well suited for liquid cleaners.

Santomerse 30-X is a crystal-clear, pale-yellow, viscous liquid containing 30% solids. The solids content is made up of 85% active alkyl aryl sulfonate and 15% sodium sulfate. It is stable in the hardest water and provides remarkable resistance to decomposition by either strong acids or alkalies, even under extreme conditions . . . For application and technical data, write for a copy of Monsanto Technical Bulletin No. P-135.

Other Detergents and Wetting Agents

Santomerse 30-X, described above, is just one of Monsanto's complete series of synthetic detergents and wetting agents. Furnished in flake, powder, paste and liquid forms, the Santomerses are also highly effective as penetrants, emulsifiers, dispersing, spreading and foaming agents.

The Santomerses are adapted to a wide variety of industrial cleaning and wetting operations — textiles, dairies, laundries, metal processing, bottle washing, leather, paper — to mention just a few. For complete information, ask for copies of Monsanto Application Data Bulletin No. P-118, "Santomerse No. 1," and Technical Bulletin No. P-123, describing other products of this group.

REPRINTS OF NEW PRODUCTS ANNOUNCEMENT AVAILABLE



Twenty-five new Monsanto chemicals — for a wide variety of industrial uses — are described in a two-page advertisement in January issues of chemical trade publications.

If, by any chance, you missed this advertisement, send today for a reprint . . . Among these chemicals it is likely that you will find one or more which will enable you to reduce production costs, improve product performance and sales.

HOW TO GET MONSANTO LITERATURE

Instructive booklets, folders and technical bulletins are available for many of the hundreds of Monsanto chemicals for industry. In addition, new and revised literature is continually in preparation . . . To obtain copies free of charge, simply tell us the products in which you are interested — available material will be sent you promptly; new literature will be forwarded as soon as completed.

SLIME AND ALGAE

Santobrite provides low-cost control in cooling water towers

Operators of large and small cooling water towers find that Santobrite* keeps them free of sluggishness and obstructions caused by slime and algae. Monsanto's Sodium Pentachlorophenate, Technical, it is an inexpensive, effective algaecide — is recommended for use wherever water is not used for drinking or bathing.

The Santobrite treatment is economical because it requires no special equipment of any kind . . . The chemical is simply added to circulating water at any convenient location. Detailed advice on maintaining peak efficiency in cooling operations by means of Santobrite is available on request. Ask for a copy of Monsanto Technical Bulletin O-15.

New source of

SILICON CHEMICALS

Monsanto English subsidiary expands

Monsanto's English subsidiary, Monsanto Chemicals, Ltd., has recently purchased control of Silicon (Organic) Developments, Ltd., Bridgend, Glamorgan, England.

The newly acquired Monsanto unit specializes in the manufacture of silicon chemicals, produced from a metal which is extracted from sand. These compounds have a wide variety of uses, including water repellents, golf ball centers, calking strips and electrical insulators. One of the silicate esters, Silester, is important in the precision casting of turbine blades for jet propulsion power units — is also used as a waterproofing compound for cement, brick and stone walls.

Anyone interested in the possibility of utilizing these products in British or European operations is invited to send for full information. Write Monsanto, Foreign Department. *Reg. U. S. Pat. Off.

☆ ☆ ☆

MONSANTO CHEMICAL COMPANY, Desk B, 1702 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal.

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CHEMICALS — PLASTICS

Serving Industry . . . Which Serves Mankind

MONSANTO CHEMICAL COMPANY
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Name _____ Title _____

Company _____

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IT'S EASY TO TURN THIS VALVE

NORDSTROM VALVES MAKE OPERATION EASIEST—ALWAYS

LUBRICATED PLUG

"SEALDPORT" SYSTEM

QUARTER-TURN

ROTARY ACTION

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RESILIENT SEATING

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NO VOIDS TO CLOG

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CORROSION-RESISTANT

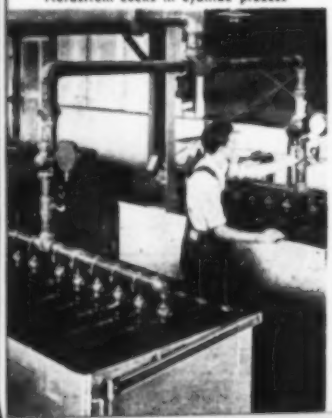
EROSION-RESISTANT



Hydraulic pressure replaces manual effort

The Nordstrom valve relies upon two positive forces to effect closure: (1) holding the plug on its slideable seat, and (2) hydraulic pressure of the lubricant transmitted in plug and body grooves to form a plastic seal around each port. No wedging force is necessary. No "jamming" to get a tight seat contact.

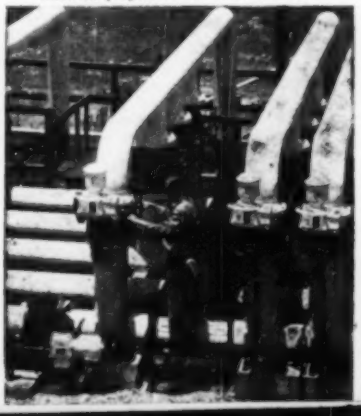
Nordstrom cocks in cyanide process



Withstanding corrosion on paper digester

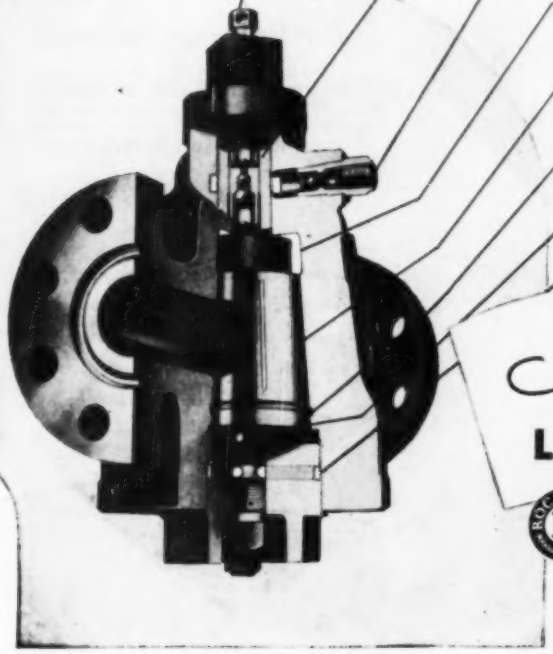


Electrically operated valves on manifold



. . . . you don't have to force it!

CHECK THESE POINTS OF SUPERIORITY



- EXTERNAL LUBRICANT SCREW OR GREASE GUN APPLIES INTERNAL PRESSURE (TO SEAL, JACK AND LUBRICATE)
- THREADED STEM IS SEALED BY STEM PACKING
- STEM PACKING CAN BE INJECTED WHILE VALVE IS IN OPERATION
- FLOATING EQUALIZER TRANSMITS TORQUE FROM STEM TO PLUG
- FULL FLOATING PLUG IS BALANCED UNDER HIGH PRESSURES
- LUBRICANT GROOVES IN PLUG CONNECT WITH BODY GROOVES TO FORM POSITIVE SEAL AROUND PORTS
- SINGLE BALL THRUST BEARING APPLIES THRUST AGAINST SPRING TENSION DISC UNDER PLUG
- ANNULAR SEALING GROOVE, FILLED WITH PLASTIC STEM PACKING, SEALS BOTTOM PLUG AND ADJUSTING SCREW

Nordstrom

LUBRICATED VALVES

ROCKWELL

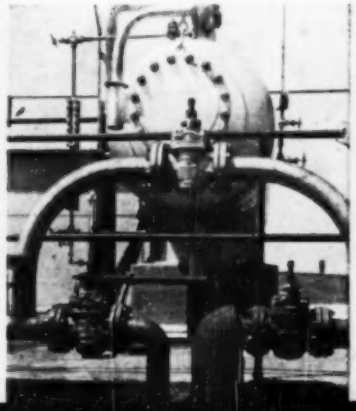
NORDSTROM VALVE DIVISION

Rockwell Manufacturing Company

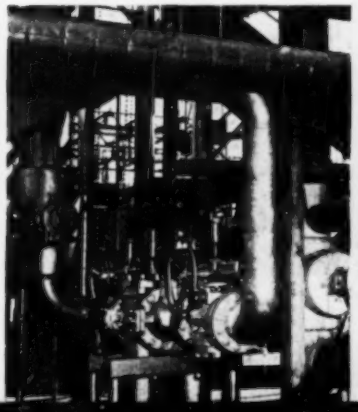
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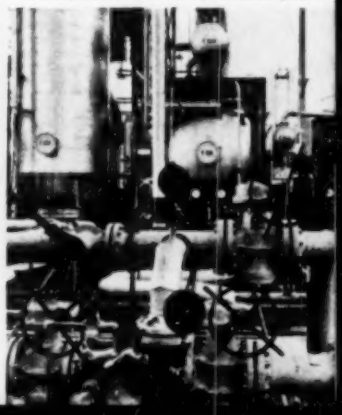
Valves on caustic lines



Gear operated valves in steam plant



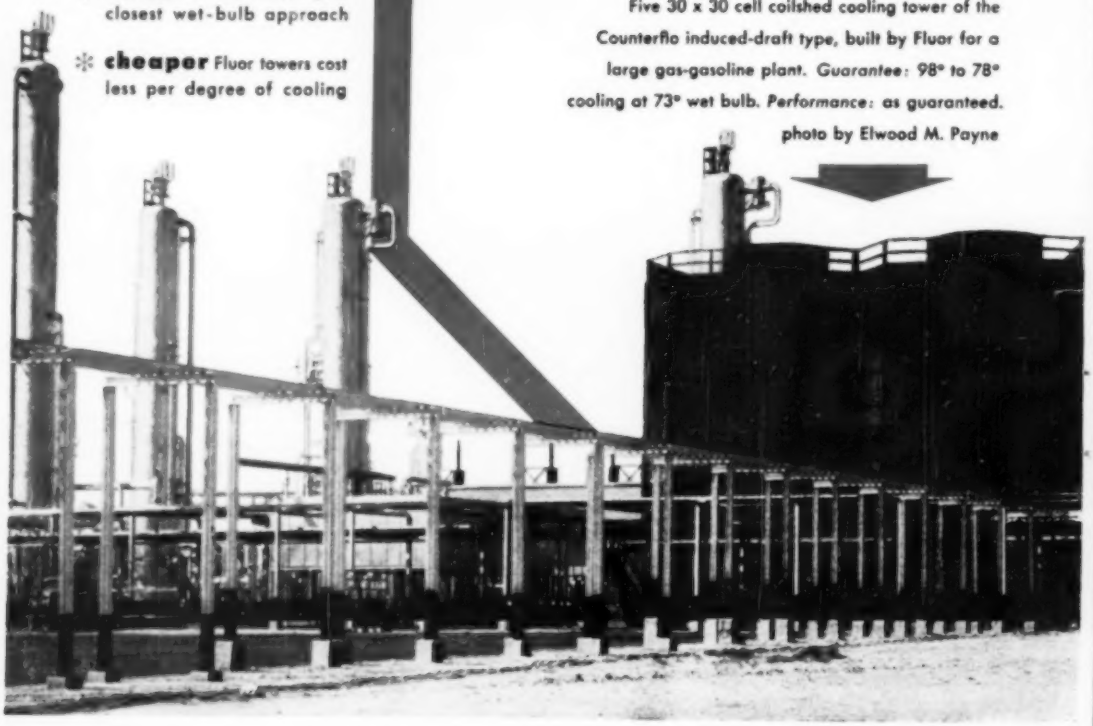
Gear operated valves in hydrofluoric plant



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FLUOR
counterflo cooling tower
delivers
colder water cheaper

Every Fluor *Counterflo* tower cools to the guaranteed temperature. Does this *insured performance* cost you more? No! Fluor towers are prefabricated in standard cell sizes for low erection costs—and engineered to give maximum cooling per fan horsepower.

- **colder** Fluor towers give closest wet-bulb approach
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Five 30 x 30 cell coilshed cooling tower of the Counterflo induced-draft type, built by Fluor for a large gas-gasoline plant. *Guarantee:* 98° to 78° cooling at 73° wet bulb. *Performance:* as guaranteed. photo by Elwood M. Payne

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fin • fan units

pulsation dampeners

gas cleaners

mufflers

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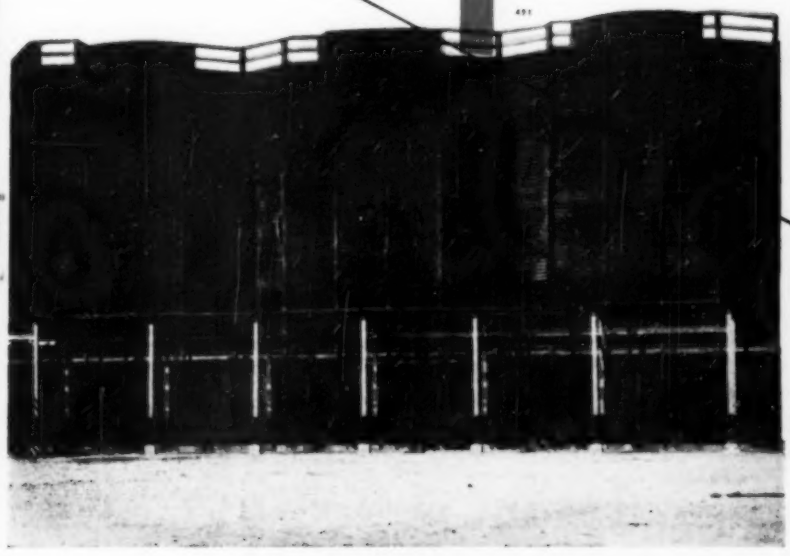
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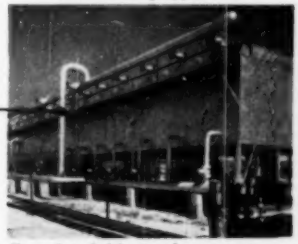
SAVE YOUR COMPANY MONEY

Before buying a cooling tower, we urge you to look at the engineering *facts* presented in the new booklet "Colder Water Cheaper". Write us for your copy.





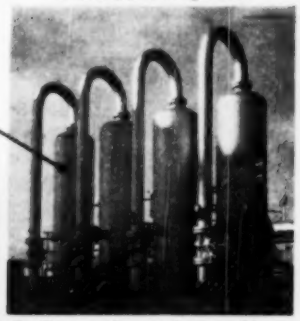
Fluor Aerator cooling towers, have distinctive economy features and are most practical in certain cooling applications.



Fluor air-cooled heat exchangers are more economical where make-up water is expensive, where water has bad scaling characteristics, and where the temperature of liquid to be cooled is relatively high. (Manufactured and sold by Fluor and Griscom-Russell Co.)



Fluor pulsation dampeners remove destructive vibrations and instrument irregularities caused by pulsative gas flow.



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McGraw-Hill Surveys BUSINESS NEEDS

If it can get the money American industry in 1949 will go full steam ahead with a vitally-needed program of improving its facilities. This program since V-J Day has kept business expanding and has made belated headway in modernizing industry.

Furthermore, if it can get the money American industry will carry on for the next five years with its unprecedented program of expenditure for new plant and equipment. Plans already made call for spending about $55 billion.

These are findings of the McGraw-Hill national survey of "Business' Needs for New Plants and Equipment." Major results of the survey, which have been rechecked since election day, are summarized on the following page. They report what American industry is now planning to spend for new plant and equipment. *They do not and cannot show what will be done if the plans are hamstrung by political action.*

In 1949, the survey shows, American industry plans to spend $14.1 billion for new plants and equipment. That is only about 5% less than was actually spent in 1948.

If these plans are carried out, actual capital expenditures this year may be somewhat larger than they were in 1948. That is because expenditures usually prove to be larger than planned.

Fulfillment of American industry's plans for investment in new plant and equipment this year would no doubt mean a continuation of general prosperity. The record shows that when capital expenditures are high general business thrives.

Even more remarkable than the 1949 prospect is the fact that:

Industry already plans to spend $41 billion in the years 1950-53 to improve its plants and equipment.

Plans tend to taper off, of course, as they are pushed further into the uncertain future, five years from now. But the striking fact is that plans for expenditures so far ahead are as great as they are. They show American industry's need for tremendous improvements in its plants and equipment.

Again, let there be no mistake. These survey findings are not a five-year forecast. They report what leading corporations now are planning to do – *if they can get the money.*

But – won't industry be top-heavy with plants and equipment if it carries through any such program?

The answer is clearly – "No".

Here are some of the reasons why not that were disclosed by the McGraw-Hill survey:

First, manufacturing industries are shifting emphasis from expansion to improving efficiency.

They have increased their total capacity 56% since 1939. Their expenditures in 1948 went almost 50-50 for expansion and improvement. But in the next five years they plan to spend three-quarters of their funds to replace and modernize facilities, only one-quarter for expansion.

Second, the prospective rate of expenditure for new plant and equipment is relatively low.

Planned expenditures for new plant and equipment in 1949 represent about 7.5% of the present value of all plant and equipment. That rate of capital expenditure is no higher than the rate during previous periods of prosperity. And industry must overcome years of starvation for new equipment, caused first by the depression of the 30's, then by diversion to war production.

Third, industry is following an extremely cautious policy in buying new equipment.

Three out of four companies report that they will not buy equipment unless it will pay for itself within five years. And a third of the companies report that they expect new equipment to pay for itself within three years. The reason most frequently given for such expectations was that all the money available can be spent on equipment which does pay for itself quickly.

The program of capital expenditure planned by American industry is one of the greatest bargains ever offered to the American people.

To pay for itself in a few years, as equipment must if most companies are to consider buying it, that equipment

continued on next page

WHAT THE SURVEY SHOWS

● HERE ARE THE MAJOR FINDINGS of McGraw-Hill's survey of "Business' Needs for New Plants and Equipment". Rechecked since Election Day, results show what industry is now *planning* to spend for new plants and equipment. They do not forecast what will actually be spent. The survey shows:

1. Industry now plans to spend $14.1 billion in 1949 – and almost $41 billion in the four years beyond, 1950-53.
2. Manufacturing industries alone plan to spend $7.2 billion in 1949. This is 7.5% of the estimated value – $96 billion – of all manufacturing facilities.
3. Manufacturers estimate conservatively that it would cost $136 billion to completely replace their facilities with the most modern plants and equipment available.
4. Postwar expansion is virtually complete in most manufacturing lines. Major exceptions: steel and petroleum refining.
5. Expansion programs of railroads, utilities, and oil companies still have two to five years to run.
6. Manufacturing industries have increased their capacity 56% since 1939. But expansion is slowing down. Increase planned in the next five years is only 13%.
7. Efficiency is emphasized more and more in planning new facilities. Manufacturers plan to devote almost three-quarters of their funds to replace and modernize. In 1948, 58% went to increase efficiency this way.
8. Equipment should pay for itself in five years or less, say three out of four manufacturing companies. New buildings, say 77% of them, should pay out in 15 years or less.
9. Profits and reserves are counted on to pay for new buildings and equipment by three out of four manufacturing companies. Some 15% expect to borrow, only 9% plan to sell stock. However, 20% would like to sell stock, only 4% want to borrow.
10. More liberal depreciation allowances for income tax purposes would prompt almost two-thirds of the companies to speed their purchase of new plants and equipment.

● A copy of a complete report on "Business' Needs for New Plants and Equipment" may be obtained by writing me at McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

must promise to produce much better products or make great savings in labor and material. The savings go first to the companies buying the equipment but, as they always have, they soon spread to everyone in the form of better products at lower costs.

Where does industry expect to get the money to buy this bargain for the American people?

Most of the companies covered by the McGraw-Hill survey (76% of the total) count on their own resources – largely profits – to pay for new plant and equipment. About 15% of them expect to borrow money, although only 4% like the idea of getting saddled with fixed debt. Only 9% of the companies expect to sell stock to investors, although twice that many report they wish they could.

What are the chances that business can get the money?

The survey provides no answer to that question. No survey can.

The answer will come from Washington – in what Congress does about taxes on profits and taxes on the millions of Americans who might invest a part of their income in industry's new plants and equipment.

The answer will be found also in the energy and skill shown by investment bankers, particularly in mobilizing the resources of the millions of Americans whose incomes have increased enough since 1940 to make them potential direct investors in industry.

Still another important part of the answer will be given by labor leaders. About half the companies surveyed by McGraw-Hill are holding back on new construction – primarily because of high costs. What organized labor does about wages and productivity can swell or shrink that percentage.

The McGraw-Hill survey leaves no doubt that American industry is fulfilling its responsibility. It is planning the capital improvements needed to make the nation secure, prosperous, and progressive.

But business today lacks confidence and badly needs added incentives. Proper taxation and increased depreciation allowances are vital if we are to open the capital markets to finance industry.

What will happen now depends in large part on what is done in Washington. In his State of the Union message, the President said that "business should plan for steady, vigorous expansion." But in his budget message he proposed new taxes which would divert a substantial share of the money industry is using for expansion and improvement. Moreover, he said nothing about the vital issues now freezing the capital markets.

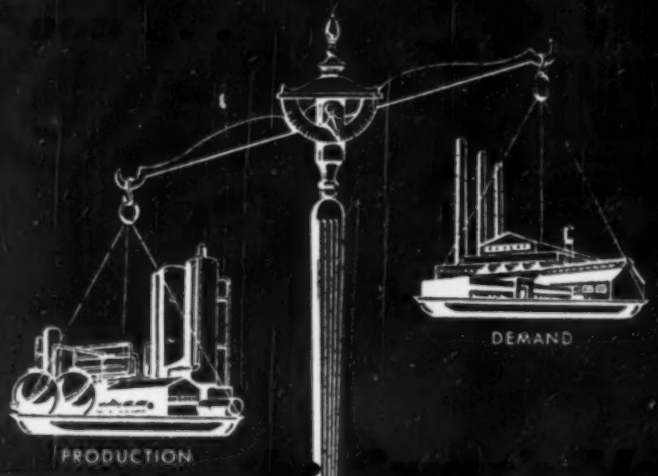
It is not possible to have it both ways. Fulfillment of the President's tax program means cutting industry's program for new and better equipment. It means slowing down industrial progress. It means delaying the advance toward much higher standards of living tomorrow in order to have a little more government spending today.

I urge you to see that your Representative and your Senator have all the facts on industry's needs for new plant and equipment. What they do to this program will have a decisive bearing on the nation's security and welfare.



President, McGraw-Hill Publishing Company, Inc.

This is the fourth editorial of a special series on industry's needs for new plants and equipment – and what these needs mean to all Americans.

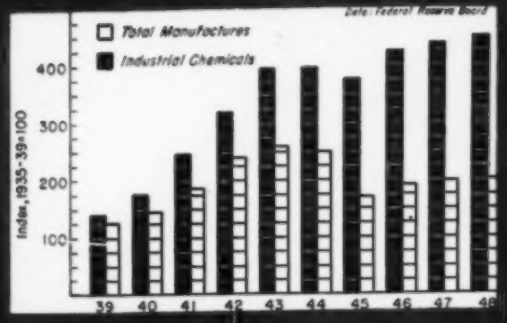


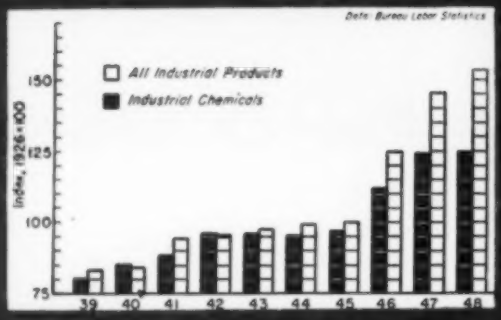
MANY commodities—chemicals included—are now in or approaching a critical period of transition. The inevitable change from a seller's to a buyer's market can be essentially a healthy development for our industries. Yet too often we view it with apprehension, as if it meant the end of good times, the turn from feast to famine. How wrong we are in that conclusion is evident from some of the wholesome changes that have already occurred in tires, textiles and plastics, to mention but a few products of process industries. Here lower prices have served to stimulate demand and bring back a balance with efficient production.

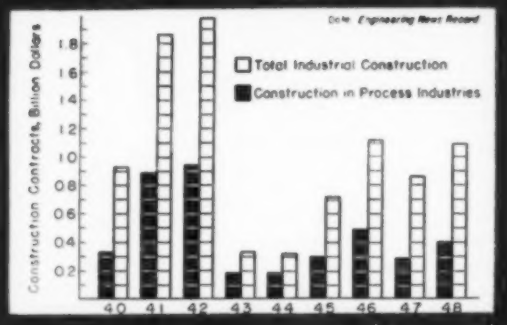
Your editors have had to muster considerable courage, therefore, in tackling the theme of this year's annual review number. Not content with balancing of books for 1948, we have stuck out our combined necks in attempting to answer for all chemical commodities that ubiquitous question: How near is the buyer's market? We have tried our best to pry into the future to see how the supply-demand balance will look during the year ahead.

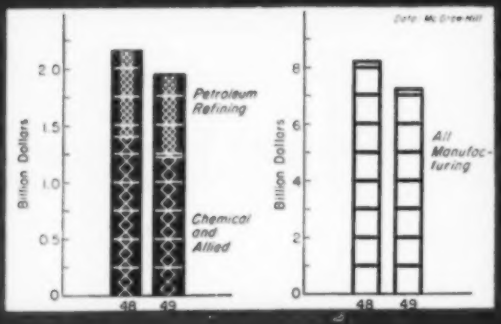
Fortunately, we have had able help from both within and without the industry. The McGraw-Hill economists have sized up the business prospects of the process industries and have given us the very encouraging results of their survey of projected capital expenditures. A consulting engineer skilled in industrial appraisals contrasts his views with those of an eminent investor in chemical securities. We have shared with the Chemical Market Research Association in a unique paper on the higher break-even points that threaten profits in some of our industries. All this gives point and purpose to the comprehensive tabulation and charting of "Process Industry Finances."

To round out these facts and figures of the process industries is a timely assortment of new plant articles, flowsheets, technical data and news of people, products and equipment. For, as we have so often said before, the most important balance of all for the chemical engineer is a proper weighting of economics and technology. A buyer's market is but a challenge for more efficient and economical production and distribution. And that, in the final analysis, is the only sound basis for progress in industry and profession.


Data: Federal Reserve Board
Total Manufactures
Industrial Chemicals
Index, 1935-39=100
400
300
200
100
39
40
41
42
43
44
45
46
47
48


Data: Bureau Labor Statistics
All Industrial Products
Industrial Chemicals
Index, 1926=100
150
125
100
75
39
40
41
42
43
44
45
46
47
48


Data: Engineering News Record
Total Industrial Construction
Construction in Process Industries
Construction Contracts, Billion Dollars
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
40
41
42
43
44
45
46
47
48


Data: McGraw-Hill
Billion Dollars
2.0
1.5
1.0
0.5
0
Petroleum Refining
Chemical and Allied
48
49
Billion Dollars
8
6
4
2
0
All Manufacturing
48
49

The Economist Appraises

Process Industry Prospects

HIGHLIGHTS FOR 1949—

1. **Continuation of booming business well into the year under the impact of economic forces already in motion.**
2. **Business for the latter part of the year subject to change without much notice by political developments in Washington and/or Moscow.**
3. **Greater resistance to new altitude records in production and sales than at any time since V-J Day.**

McGraw-Hill Department of Economics

■ GENERAL business which both shapes and is, in lesser degree, shaped by what goes on in the chemical process industries, now has only one way it can go. That is down. The controlling reason is that today it is using just about all of the available labor. Only about 2,000,000 are unemployed. That is less than what is generally considered a rock-bottom unemployment for an economy the size of ours. So there can not be much more business done unless people start working a lot harder. And that does not appear to be in prospect, partly because so many jobs are available.

With general business having down as the only possible direction it can go, we are fairly safe in predicting that that is the way it will go, and the chemical process industries will go with it. Also there have been a number of recent developments to reinforce the inclination to trail along with the law of probabilities. Some lines of the textile business have sagged badly. The election returns upset a lot of business people emotionally, and produced harbingers which might turn into more substantial disturbances by political action later.

However, safe as a forecast of a downswing of business in 1949 would seem, the present prospects are that there will be no downturn of formidable proportions, at least until well into the year, say Labor Day. The general reason is that economic developments already in full swing promise to carry business as a whole at full steam ahead for many months. There will be droopings and saggings here and there, as there will in the process industries, but there is no reason to believe that business as a whole will be dragged down by them. Here are some of the key reasons:

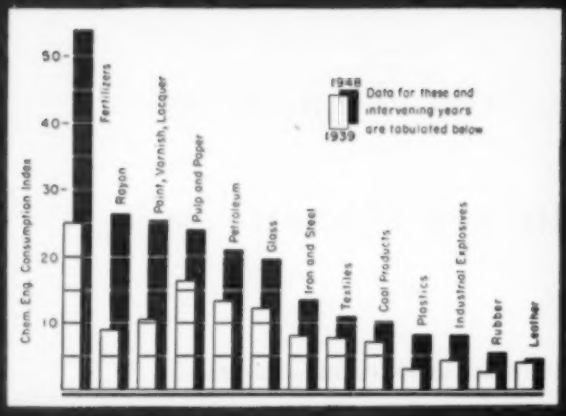
Construction has in prospect its biggest postwar year. Total dollar volume may well run to $19 billion—as against about $18 billion this year. Homebuilding may be off a little from 1948, but not much. Increased federal aid to housing is likely to pick up any slump. Industrial building is on the downtrend. But commercial construction is still rising. And a new record will probably be set in public spending on schools, highways and similar necessary projects.

The nation's farmers are assured of a relatively prosperous year in 1949 by the government program which supports prices for their basic crops. Even with income declining, the farm market would still be a strong one. Farmers hold large amounts of savings and are comparatively free of mortgage debt.

Retail lines still have ample purchasing power behind them. In fact, consumers are managing to beat the cost of living and save more, as incomes are rising and food prices have dropped. Although shoppers may be more selective, they have the money to buy a tremendous volume of goods in 1949.

Strongest prop of all under the present boom is the continued heavy investment by business in new plants and equipment. The latest McGraw-Hill survey (see p. 102) shows that industry will spend almost as much on capital goods this year as last.

Government too will be buying durable equipment on a large scale. President Truman has projected military expenditures for next fiscal year at $15 billion. A year ago they were $10 billion. The European Recovery Program is just getting into high gear. This will cause a rise in our exports,



particularly of machinery, in the coming months.

All these factors should keep business rolling along at or near peak levels until the political atmosphere clears later in the year. Then a number of things could readily change the picture.

Our foreign relations are exceedingly important. Actions by the Russians might force the U. S. to add $5 billion or more to the defense budget now in sight. If so, all the problems of inflationary government spending would return. On the other hand, if the "peace party" in the Kremlin should win out, the outlook for domestic business also would change.

On the domestic front, a large increase in taxes on profits would cut down business spending for new plants and equipment. This would be true whether Congress voted an excess profits tax or a higher tax rate on all corporation profits. About two-thirds of all profits now are going into new buildings and tools. A tax squeeze on business' spending of its profits would slow down the capital goods industries. This in turn would cut down employment and prosperity in the rest of the economy.

How will the process industries, in particular, fare during 1949? Like the rest of business, they will probably do very well unless and until the economy is upset by one or more of these political developments.

So long as business activity—and industrial production—run along at present peak levels, chemical industries will share in the general prosperity. In 1948 chemical consumption picked up 5 percent to match a 3 percent rise in overall industrial production. And some further gain is likely in the early months, at least, of 1949. Even if production in most industries levels out, the long term uptrend in chemical use should continue. Paints and plastics, for example, seem certain to hit new sales peaks.

But any growth in total chemical consumption during 1949 will be small. Industrial activity as a whole cannot rise much because of our limited manpower. The chemical industry itself each year is putting less new plant and equipment into operation than in the preceding year. And in more and more fields capacity is catching up with the greatly enlarged postwar demand.

On the other hand, if some let-down in total manufacturing does occur this year, chemical sales may not show a corresponding drop. The bulk of chemical production does go to industrial users, but there are also important markets in agriculture (for fertilizer) and in construction (for paint and varnish, glass, etc.). These markets are likely to be especially strong in 1949.

In fact, demand for each of the chemical lines will vary according to conditions in the consuming industries. Here is the outlook for the fields of business which take the largest shares of chemical output:

Fertilizer. Demand should be sustained at a high level. This will be another year of all-out farm production in which farmers are assured by government of present high support prices on their basic crops. Declining prices lowered income from crops in 1948 but little further drop is likely in 1949, because of the government support program. Total farm income is not expected to be off more than 10 percent from this year's record $30 billion. Most farmers still have high enough income and savings to encourage free spending on fertilizer.

The Department of Agriculture is urging the use of mixtures which are high in plant food content, in order to save freight charges. This should increase the demand for nitrogen, phosphate and potash. The market for nitrogenous fertilizers continues particularly strong because of the world shortage. Supplies are still being allocated by the International Emergency Food Committee.

Pulp and Paper. Production in 1948 set an all-time record. Steady additions to capacity have increased output 28 percent since the war ended. But this spectacular growth period ap-

Chem. Engineering's Index of Chemical Consumption

(1935 = 100)	1939	1943	1944	1945	1946	1947	1948 Est.
Fertilizers	25.13	40.12	39.76	42.21	44.85	51.15	54.00
Pulp and paper	16.59	19.05	18.87	19.44	21.47	22.62	24.05
Glass	12.51	18.80	19.93	19.64	21.71	21.77	19.07
Petroleum	13.45	15.56	18.10	18.71	18.82	20.03	21.06
Paint, varnish and lacquers	10.66	15.40	16.71	17.37	21.27	23.85	25.40
Iron and steel	8.21	13.49	13.33	11.96	10.90	13.01	13.65
Rayon	9.08	15.53	16.81	18.38	19.89	22.69	26.40
Textiles	7.89	11.43	10.53	10.30	11.15	11.07	10.95
Coal products	7.17	9.47	10.05	9.41	7.96	10.23	10.35
Leather	4.16	4.56	4.25	4.54	4.60	4.75	4.46
Industrial explosives	4.53	5.52	5.06	5.36	6.29	7.40	8.25
Rubber	2.79	3.00	3.00	4.55	6.81	5.85	5.41
Plastics	2.05	4.80	5.24	5.75	6.41	7.41	8.28
Total	124.15	176.73	181.64	187.62	201.43	221.85	232.42

pears to be about over. Almost all types of paper are now available in desired quantities. Inventories are relatively high. The volume of production in 1949 will depend principally on the volume of output in the nondurable goods industries, which use paper for packaging. If they pick up, some increase may occur in paper use and output, but it will be smaller than the 9 percent annual gain averaged for the past three years.

Glass. This industry went through a readjustment in 1948, as production of glass containers fell off sharply. Container output in 1949, however, should hold close to the 1948 rate. Meanwhile, more window glass will probably be needed. Nearly as many homes are expected to go up this year as last. And construction of stores and offices is expected to show a considerable increase. More flat glass will also be needed for the 5 percent more automobiles expected to roll off assembly lines.

Petroleum. A huge construction program has finally brought output of petroleum products in line with demand. In fact production in 1949 will probably run below the rate established in the fourth quarter of 1948 when stocks were being built up. Gasoline, kerosene and distillate fuel oil are still in increasing demand. Actual consumption of oil products may be 5 percent higher this year than in 1948. But since less production will be diverted to inventory, the industry will not have to step up output from present levels.

Paint, Varnish, Lacquers. Paint sales are riding the construction boom. They gained 3¼ percent in 1948, with prices falling, and may pick up more this year. Physical volume of construction in 1949 should be at least as high as 1948 and could beat last season as more building materials become available. Although industrial plant construction is turning down, commercial and public utility construction, as well as public projects, are scheduled to rise. Close to 900,000 new homes should be started in 1949. Millions more still need painting deferred during the war and postwar years.

Iron and Steel. If the managers keep up with the technicians, steelmaking appears to be on the verge of a revolution in production methods. The use of tonnage oxygen in blast furnaces, continuous casting of ingots and new adaptations of electric furnaces all promise to step up production in the long run. Conventional facilities too are being expanded in 1949 to meet the pressing demand for metal. Ingot production later this year may reach an annual rate of 96 million tons, compared with about 88.5 million tons in 1948. Completion of additional finishing facilities should mean an even greater increase in the flow of finished shapes to metalworking industries.

Production should benefit from the increased availability of scrap, particularly from Germany. On the other hand, approaching depletion of domestic iron ore reserves will raise chemical problems in the treating of lower grade ores.

Textiles and Rayon. Output of textile products dropped sharply in the final quarter of 1948. Activity in the woolen industry dropped 20 percent below the corresponding period of 1947; cotton, almost 10 percent; and even rayon slowed down a little. Prices were slashed too. In cotton goods, the drop averaged 20 percent. This readjustment, long overdue, signaled the end of abnormal consumer spending on wearing apparel which characterized the early postwar period.

Production should pick up this year, as national income is high enough to support heavier fabric purchases at present lower prices. Cotton textile output should reach 9.5 billion yards in 1949, close to the 1948 total and above the rate of later months.

Woolen products are still running into heavy consumer resistance because of prices. Although some pickup from the fall doldrums should take place, 1949 is not likely to be as good a year as last.

Rayon production increased by a sixth in 1948. Some further gain this year is assured by the introduction of new capacity. But the spectacular postwar growth in rayon usage is tapering off. Raw cotton is still cheaper than rayon. And the great increase in rayon supplies has temporarily caught up with new uses.

Coal Products. Production lagged in 1948, despite the fact that more coal was carbonized in providing coke for higher steel output. This has been attributed to the use of low grade coking coals and the poor condition of byproduct coke ovens, a third of which are in need of replacement. With the over-all coal supply improving, better grades may be available in 1949. And some new batteries of coke ovens will be in operation. Consequently the step-up expected in steel production should mean more coke-oven byproducts.

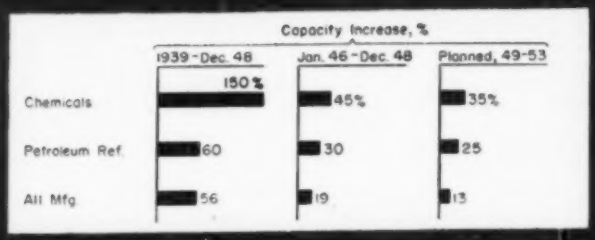
Leather. Shoe production has been declining in the face of consumer resistance to high prices. Price cuts and a revival in output seem in order for 1949. Shoe and leather prices are already down some from their 1948 highs. But the cost of leather may not drop quickly. Domestic hide supplies are not due to increase much until the fall months. This could limit consumption in the months just ahead. For the year as a whole production is not likely to top 1948 figures.

Rubber. 1948 consumption of rubber topped the million ton mark for the third consecutive year. Although 10 percent less rubber was used than in 1947, the total was still more than double prewar usage. The current year should see activity nearly as high. Backlog demand for tires has been pretty well worked off, but new markets for rubber are increasing, particularly mechanical rubber goods and latex foam products. These developments may eventually make the rubber industry less dependent on cyclical fluctuations in automobile production. In 1949, however, new tire requirements for increased auto production will be an important aid to demand.

The proportion of natural to synthetic rubber is still increasing as supplies of natural from the Far East improve. The industry used 11 percent more natural rubber and 20 percent less synthetic in 1948 than a year previously. However, capacity is being expanded in 1949 for synthetic "cold" rubber, which is expected to find a wide range of applications.

Industrial Explosives. Consumption continues at an extremely high rate because of the heavy volume of work to be done in mining and construction. The demand for coal is easing, and output may slow down in 1949. The need for explosives may also be reduced in the long run by perfection of mechanical coal cutting machines. But these will not be a factor this year. Meanwhile, an increase in heavy construction will call for more explosives in that field. This should sustain overall demand unless there is a serious shutdown in the coal mines.

Plastics. This is still the fastest growing of the chemical industries. Production of plastic materials jumped another 15 percent in 1948 to reach 815 million pounds. Producers have improved their market by carefully matching properties of particular plastics with applications in both industrial and consumer goods. This has meant better quality products and wider consumer acceptance than in the early postwar period when plastics went into many uses for which they were not well suited. The continued shortage of metals should be a stimulus to further replacement of these materials by plastics in 1949. Production can rise more readily this year due to easing in supplies of basic chemicals in the buyer's market.



$ Millions Planned for Capital Improvements

	1948	1949	1950	1951	1952	1953
Chemicals	$1,400	$1,220	$1,310	$1,210	$1,120	$1,100
Petroleum refining	740	720	680	550	580	500
Food	595	585	535	515	370	340
All manufacturing	8,160	7,197	6,211	5,395	4,995	4,850
Utilities, communications, Mining, Transportation	6,690	6,933	5,765	5,065	4,635	4,145
Total	14,850	14,130	11,975	10,460	9,630	8,995

Economists See Nearly $1\frac{1}{4}$ Billion This Year

McGraw-Hill Department of Economics

■ CHEMICAL industries now plan to go full speed ahead in expanding and improving their plants and equipment.

If they can get the money, they plan to continue capital expenditures at close to their 1948 level through the next five years.

While other manufacturing industries are shifting emphasis from expansion to replacement and modernization of facilities, the chemical industries plan to continue expansion at a high rate. Moreover, while other industries are tapering off on plans for capital improvements, the chemical industries hope to keep their expenditures at a high level.

These are the major findings of an unprecedented survey of "Business' Needs for New Plants and Equipment" just completed by the McGraw-Hill Department of Economics. Results have been checked and confirmed since the national elections.

For industry as a whole, the survey shows:

1. Capital expenditures in 1949, as planned now, will total $14.1 billion—only about 5 percent under actual expenditures in 1948. This includes manufacturing, process industries, transportation, utilities, and mining—but not retail and wholesale trade.

This prospect is much brighter than was expected generally. The survey shows that while postwar expansions programs in many industries are nearing completion, other industries are continuing their investment programs at a high level, or actually increasing them slightly. The metal-working industries, for example, are tapering off. But utilities and the steel industry—among others—plan to spend more in 1949 than in 1948.

With plans for capital expenditures at this high level, 1949 may see actual spending as big, or possibly slightly bigger, than 1948. Companies may well put through projects which are not anticipated now. That strongly reinforces the outlook for general good business in 1949.

2. Leading corporations are now planning to invest more than $40 billion in their plants and equipment in the years 1950 through 1953.

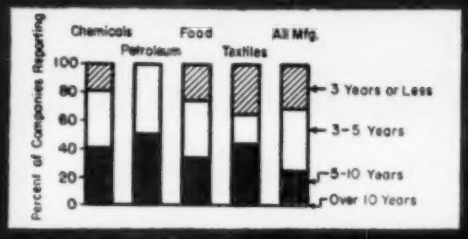
This outline of the needs of American industry for new plants and equipment is one measure of a massive program to improve America's industrial facilities. How great are the opportunities to invest profitably in new equipment is shown in another finding from the survey: Three companies out of four expect new equipment to pay back its original cost within five years. One company in three expects new equipment to pay for itself in three years or less.

Here is one thing to remember about these survey results: They are not a forecast of capital expenditures. They are, rather, a summary of the plans leading corporations now have to improve their facilities in the five years ahead. Whether or not these plans can be carried out depends on many things which cannot now be predicted.

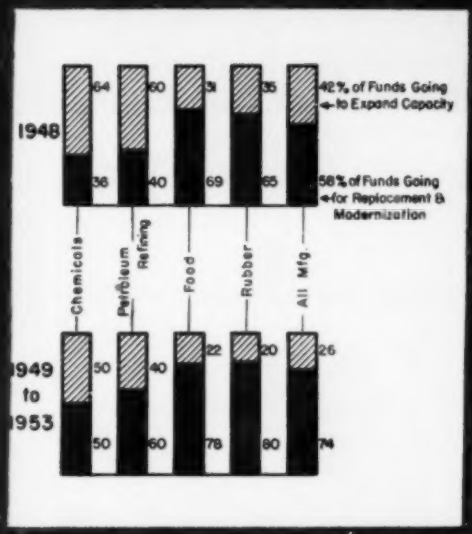
The plans for capital improvements in the chemical industries stand out from the general findings. For chemicals, the survey shows:

1. Plans for capital expenditures in 1949 total $1,220 millions. This is slightly less than the $1,400 millions actually invested in 1948. But these plans like last years, may well increase as the year goes on. There are likely to be expenditures which are not anticipated now.

Oil companies plan to spend $720







for New Chemical Plant and Equipment

million in 1949 to improve and expand refining facilities—as compared with $740 million in 1948.

2. In the years beyond 1949, chemical industries' plans now call for expenditures of $1,310 million in 1950, $1,210 million in 1951, $1,120 million in 1952, and $1,100 million in 1953.

Petroleum industries also project long-range plans for new refining facilities. They now plan to spend $680 million in 1950, $550 million in 1951, $520 million in 1952, and $500 million in 1053.

Again, let there be no mistake. These results of the survey are not a five-year forecast. They represent, rather, what the industries are now planning to spend to improve and expand their facilities.

These plans are dependent, of course, on industry's ability to get the money to carry them through. And that depends on many things—from what Congress does about taxes to technological developments—that cannot be predicted.

Particularly striking in the survey are its findings about the increase in capacity in industry. American industries—manufacturing, chemicals, utilities, mining, communications and others—have raised their capacity 56 percent since 1939. Carrying through their plans for capital expenditures in the next five years would add another 13 percent to physical capacity.

But here the chemical industry stands out sharply again. The chemical industry has raised its capacity 150 percent since 1939. In the last three years alone, since January 1946, it has added 45 percent. Continued expansion as planned would raise capacity another 35 percent by the end of 1953.

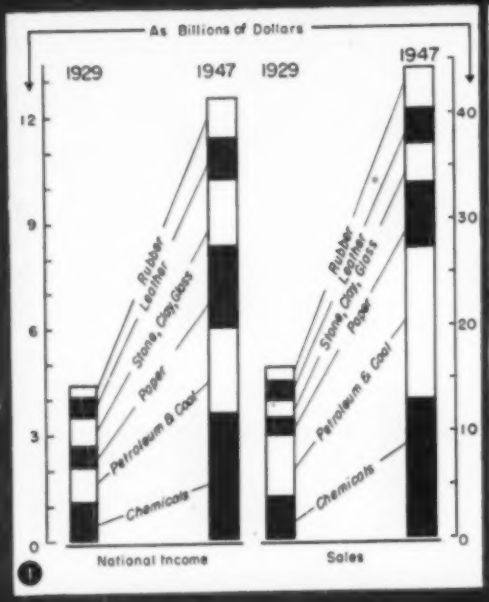
This sharply indicates how chemicals' growth is continuing. Chemicals apparently had no "postwar expansion" as other industries knew it. The growth in chemicals since 1939 is, rather, part of the industry's long-term continuing growth. Its products and demand for them are still increasing at a rapid rate.

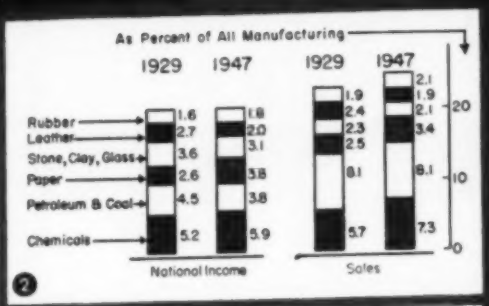
But where is the money coming from to pay for all this?

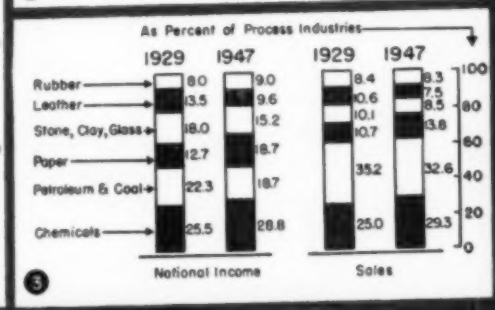
Industry's own resources are expected to provide the great bulk of it—the McGraw-Hill survey reveals. Three companies out of four—76 percent of all manufacturing companies, 73 percent of all chemical companies—plan to use their own earnings and reserves to provide all the funds they will need. When it comes to plans to raise money from outside sources, however, the chemical industry differs again from other businesses. No chemical company surveyed by McGraw-Hill plans to sell stock, although 9 percent of all manufacturing companies do. The chemical companies that do have to raise some part of their funds outside plan to get loans.

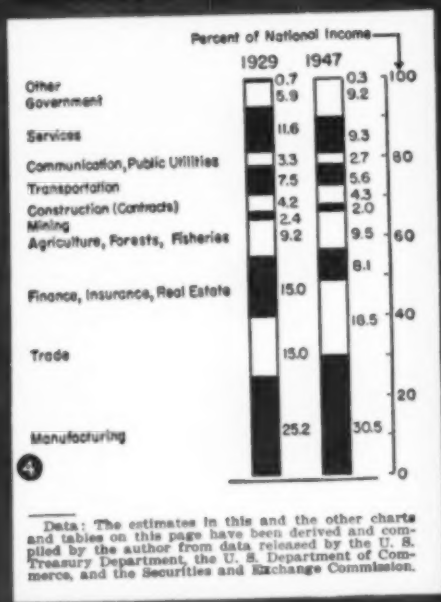
The survey also showed that a change in corporate taxes, or in the Treasury's depreciation policy, would speed expansion in chemicals. If the corporate tax rate were reduced from 38 percent to 20 percent, 73 percent of the chemical companies report that they would increase their plans. Similarly, if they were allowed to write off new facilities in five years, 82 percent would enlarge their plans.

McGraw-Hill's Department of Economics conducted this survey. It is based on returns from companies that employ more than 5 million workers. These include 60 percent of the employees in the industries that make two-thirds of all the industry's capital expenditure.

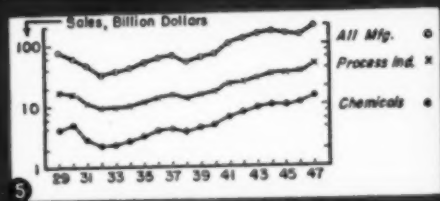






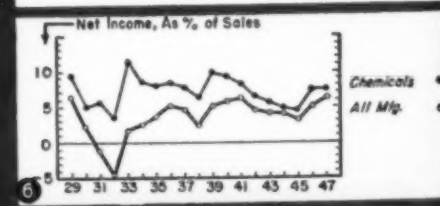


Data: The estimates in this and the other charts and tables on this page have been derived and compiled by the author from data released by the U. S. Treasury Department, the U. S. Department of Commerce, and the Securities and Exchange Commission.



Sales, Index Basis (1935-39 = 100)

	All Mfg.	Process Industries	Chemicals
1936	103	99	100
1937	113	109	108
1938	98	98	97
1939	105	110	112
1940	121	121	126
1941	170	159	170
1942	214	175	191
1943	262	204	228
1944	278	227	260
1945	256	230	269
1946	238	248	279
1947	325	283	341



The Engineer Appraises Process Industry Prospects

We contribute heavily to the national economy in terms of invested capital, gross income, sales and profits.

A. J. P. Wilson
Consulting Chemical Engineer, Great Neck, N. Y.

■ "WHERE ARE WE GOING?" To answer that question, the good navigator determines where he is now in relation to where he came from. Likewise, the good chemical engineer, as well as the banker and the investor, should study the present position of the process industries in relation to their past in order to estimate intelligently where they are going.

A recent study of the long-term trends of the process industries and their place in the national economy reveals some very significant facts: As a whole this important group of industries is in a very strong position. They have established an excellent historical record. They have demonstrated unusual vigor by increasing their share in the national income, in sales and total assets. Their profit position is good, and apparently more stable and less subject to declines than most other industries.

Naturally, there is no single factor which conclusively indicates the progress of an industry. It is necessary to appraise its growth on several bases in order not to be misled by unusual behavior of one particular factor. Of several good bases on which an industry's trends may be judged, these are the best: (1) Contribution of the industry to the national income; or value contributed by the manufacturer. (2) Value of products; or sales in dollars. (3) Value of total assets; net tangible worth, or invested capital. (4) Net income after taxes, or profit.

The long-term trends of the major segments or businesses that comprise our national economy indicate two premises: (1) As everyone knows, our national economy has increased tremendously in the past 20 years. Our national income has increased from $87 billion in 1929, the peak of the last big boom period, to an estimated $220 billion in 1948. (2) Most segments of the national economy have grown comparably with the national total. This fact is not generally so well known as the first premise, judging by the oft-repeated commends that such-and-such an industry (or, for example, that the "Big Three" in the chemical field) are running away with all the business. Again, our study reveals that there has been no such domination.

Of all major classifications of business contributing to the national income, the Manufacturing group (within which the process industries fall) has shown the largest numerical increase. The percentages for 1929 and 1947 are compared in Chart 4.

Major gains have also been registered by the increase in governmental activities and the field of retail and wholesale trade. Declines were made by Finance, Insurance, and Real Estate; Services; Transportation; and Public Utilities, including Communications.

For the purposes of this study, the process industries consist of the following classification as used by the Treasury Department and the Department of Commerce: (a) Chemical and allied products; (b) Petroleum and coal products; (c) Rubber products; (d) Leather and leather products; (e) Stone, clay, and glass products, and (f) Paper and allied products.

These classifications are all included within the manufacturing segment. The relative size in 1929 and in 1947 of each of these groups, as measured by their addition to national income and sales of incorporated businesses is shown in Chart 1. This chart portrays the better-than-average growth of the process industries. On the basis of contributions to the national income, the process industries have grown collectively from $4.4 billion in the peak year 1929 to $12.5 billion in 1947, the latest year for which comparable data are available. On the basis of dollar sales of all incorporated businesses, the process industries have grown from $16 billion in 1929 to $44 billion in 1947.

The percentage relationship to the total manufacturing classification is shown in Chart 2 for each of the major process industries, classified again on the basis of national income and dollar sales.

We have shown previously that the manufacturing segment has increased its relative position in the national economy. Chart 2 indicates that the process industries have held their relative position on both of the bases shown. The growth of their sales has been slightly greater than their contribution to the national income. Within the process industries, the chemical, paper and rubber groups have shown increases while the stone,

clay and glass and leather products groups have declines.

Now let us appraise the position of these industries on the basis of total assets. We find that the process industries registered 29.4 percent of all manufacturing assets as of 1927, and 30 percent as of 1945, the latest year for which these Treasury statistics are available. Here again we find the process industries doing relatively better than other industries.

The chemical and petroleum groups together (separate classifications were not given by the Treasury Department until 1936) have shown a rise from 18.4 percent in 1927 (20.0 percent in 1929) to 21.7 percent in 1945. This corresponds with their better-than-average performance as indicated by national income and sales. The total assets of the other four groups of the process industries have declined from 11.0 percent to 8.2 percent for the same period.

Of the four bases discussed in this article, net income or profits undoubtedly hold most interest for engineers as well as for the investor and the banker. Profits, however, naturally show much more severe fluctuations than the other bases we have considered. Corporation net income after taxes ranges from large in good times down to deficits during severe business recessions. It is of interest to note that the only major segment of the economy which did not show a deficit from 1929 to 1947 was the public utilities and communications classifications.

For the total manufacturing segment, net income after taxes fell from $4.4 billion in 1929 to a deficit of $1.4 billion in 1932. Profits recovered in 1933 to $0.6 billion, while the total of all businesses still showed a deficit. But by 1947 manufacturing's profits had reached $11 billion.

On a percentage basis, manufacturing comprised $2.2 percent of all businesses in 1929. Its percentage in the year 1933 was, of course, infinite because it showed a profit while business as a whole showed a deficit. Manufacturing's share of total business has ranged between 50 percent and 63 percent in the period from 1937 to 1947.

The manufacturing segment has done relatively well. Its growth trend in profits has not been so large as the rate of growth of the trade, services, and agriculture classifications. These groups, however, are much smaller in profit volume than is the manufacturing group. The latter has not been so consistently profitable as communications and public utilities, but its rate of growth has been much larger.

The process industries, on a profit basis, have increased from $1.2 billion in 1929 to $3.2 billion in 1947. They showed a deficit only in the depression years 1931 and 1932. On a percentage basis, net income for the process industries registered 28.6 percent in 1929 and 29.5 percent of the manufacturing total in 1947.

Here, again, the process industries have demonstrated their inherent strength by increasing their relative profit position. And, in turn, manufacturing has demonstrated its relatively better position in the national economy on each of the three bases discussed—i.e., national income, sales and profits.

Chemical industries, as represented by the subclassification "Chemicals and Allied Products," have made an excellent showing in the last two decades. They have had an appreciable increase in their contribution to national income, going from $1 billion in 1929 to $3.6 billion in 1947. The growth in sales of chemicals has been equally impressive—rising to $12.9 billion in 1947 from $4 billion in 1929 and $2.1 billion in 1932. Relative sales growth is more clearly demonstrated by the tabulation under Chart 5 showing chemical sales on an index basis, using the average of the years 1935-1939 as 100. Chemical sales have risen more rapidly than those of the process industries (shown in Chart 5).

The excellent over-all record of chemicals is clearly indicated in the percentage breakdown of the process industries shown in Chart 3.

It would therefore appear that, while the chemical subclassification has bettered its relative position within the process industries on the bases of national income and sales, it has not increased its profits as much as did the subgroup "Other Process Industries" in the year 1947. The chemical industry cannot justly be accused of abnormally excessive profits. But profits in the chemical industry have been higher and more consistent than the average of all Manufacturing. On the basis of percentage of net income to sales, chemicals have made a remarkable record (Chart 6). They have not only never shown a deficit, but have never fallen below 3 percent for the period under discussion. They have averaged over 7 percent as against an average of 3.5 percent for all manufacturing. On this same basis, chemicals have made a greater profit, percentagewise, than manufacturing in each of the years of the period studied.

One interesting use to which these analyses can be put is as yardsticks for comparing the past performances of individual companies. For this purpose they provide a foundation for more intelligent estimates of the future. They can also be used to answer authoritatively the old question of whether the Big Three chemical companies are running away with all the chemical business. Analysis reveals the following on the basis of total assets:

	1937 Percent	1945 Percent
E. I. du Pont de Nemours & Co.	16.6	11.4
Union Carbide & Carbon Corp.	6.5	5.3
Allied Chemical & Dye Corp.	5.2	3.6
Total	27.8	20.3
Total chemicals	100.0	100.0

Study of the same question on the basis of sales from 1937 to 1947, and also on the basis of net income after taxes, indicates that individually and collectively the Big Three chemical companies had a smaller percentage of the chemical total in 1947 than they did in 1937.

From the foregoing data, it should be apparent that the process industries as a whole are now in a very strong position. They have done better than the manufacturing segment on all four of the bases considered. And manufacturing has increased its relative position over the average of all businesses on three of these bases.

It is also true that the chemical, paper, and rubber industries are currently in a superior position. They have shown a better performance than that of the other process industries.

The chemical industry, in particular, has demonstrated its vigor by increased national income, sales, and assets. Its profit position has been very good. In the year 1947, its relative profit position was not so high as some of the other groups, but this might be explained by the fact that prices of chemicals have not risen as much as the prices of all commodities. Chemical profits do not appear excessive. They do appear to be more stable and less subject to severe declines than most other industries.

Looking at the future, it is reasonable to predict that the chemical industry, and the process industries as a whole, will show declines in dollar volume of sales, profits, and assets only if there is a substantial decline in general business activity. But their relative position compared to those of the other groups in the manufacturing segment will be better than the group average.

When general business rises to new peaks, it is reasonable to forecast, on the basis of this study, that the chemical industries, the paper, and the rubber industries will better their present positions.

The Investor Appraises Process Industry Prospects

CONCLUSIONS

- The chemical companies are a greater factor in our industrial economy than ever.
- Their peacetime growth promises to continue unabated, not only from new products and processes, but also from capturing markets of other industries.
- They are relatively well situated to meet possible profit squeeze in case of a recession, because price rises have been moderate and wage expense is low in relation to over-all costs.
- As a result of postwar expansion, the capital structures of some of the companies have become more pyramided, with greater debt—not quite so strong financially as heretofore. Because of greater leverage, their stocks are apt to show wider price movements.
- Although profit margins are unlikely to recover to prewar levels because of taxes, postwar margins in general have been maintained at satisfactory levels.
- Full benefit of current expansion programs has not yet been fully reflected in per-share earnings.
- When capital needs for expansion diminish, a return to more generous dividend policies should be possible.
- Because of new developments and greater competition, it is wise for investors to diversify their chemical holdings in stocks of sound companies with growth potentials.
- It is more difficult to accomplish this today because of the tremendous advance in chemical technology which even experienced investors find hard to follow and appraise.

Compares postwar with prewar trends in growth and financial structure.

Clayton Du Bosque

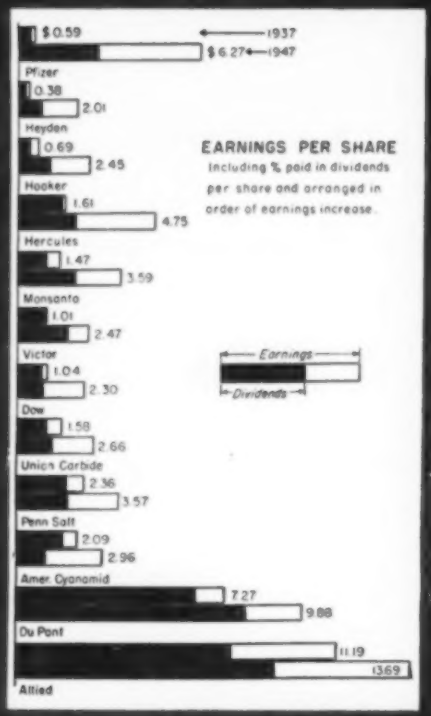
Vice President, Chemical Fund, Inc.,
New York, N. Y.

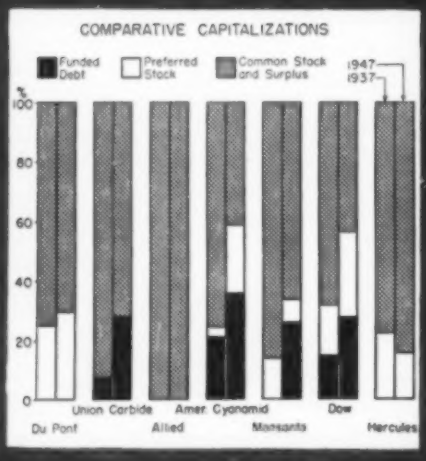
■ THE chemical stockholder is delighted when his company develops a new product for better living—for *his* better living from increased dividends. And, indeed, he has had cause for delight in the much larger return he is now getting as compared with prewar. Dividends, however, are far from his major consideration in selecting chemical investments. In fact, dividends are something like Ben Franklin's dollars which, if pennies are taken care of, will take care of themselves.

And so the experienced chemical investor looks hard at technical and business factors which produce extra profit pennies and make earnings grow into more dollars per share of stock. *Growth* is his prime criterion because the chemical companies constitute America's outstanding growth segment of industry. This being generally recognized, chemical investors pay higher market prices for shares in relation to earnings. They would rather have modest yields which grow than higher yields which do not.

Naturally the chemical investor has kept a sharp eye on technological developments during and since the war. He saw a generation of chemical research compressed into a few war years. He is aware of the war-born development of new chemical products and processes which are exerting profound changes in our whole industrial economy. He has witnessed a postwar readjustment coupled with the largest peacetime expansion program ever undertaken by the chemical industries.

Here are all the technical elements for continuing growth on a large scale but with them are also many uncertain





business elements in our industrial economy. Well may the chemical investor scrutinize these elements carefully, especially from the financial angle. Where do the chemical companies stand today compared with prewar?

In such evaluation it seems more realistic to use the peak prewar year 1937 as a base for comparison with current boom conditions. The period 1938-1941 is scarcely comparable.

It should be explained, also, that this article is based upon experience in chemical investing, since 1938, in connection with Chemical Fund, Inc., an investment company specializing in the chemical field. Statistical figures cover companies selected by the Fund for investment, which include all of the larger but only part of the medium-sized chemical companies that appear in "Process Industry Finances"—the tabular supplement to this February 1949 issue of *Chemical Engineering*.

Competition Is Keener. The chemical industry is said to be the only one which serves all 72 basic industry groups surveyed by the Bureau of the Census. Since the war these wide-spread markets have been even further expanded by the broadening nature of the coverage. Plastics, for example, have grown by replacing other materials. Synthetic fibers have cut into cotton, silk and wool. Synthetic detergents have become a real threat to soap. Synthetic rubber has established a strong position because of its qualities. The new antibiotics, penicillin and streptomycin, have made inroads on serums and vaccines. New organic insecticides, fungicides and weed-killers have stepped up the quality and quantity of crops. In food packaging, transparent film appears here to stay.

The opportunities in this aggressive trend have apparently captured the imagination of chemical industry as a whole. As a consequence, competition within the industry has changed; companies formerly concentrating on old-line products have broadened their vision. Many have created new end products from their basic chemical production, seeking better profit margins through poundage instead of tonnage sales. More importantly, many have entered the new fields being opened up.

Obviously competition has become keener. For example, two of the war-born developments, DDT and penicillin, are now being produced by a large number of companies. As a result prices have dropped sharply but, on the other hand, these products have been made available for wide distribution at a cost that many people can afford.

For chemical industry, is this bad or good? Obviously the latter because chemistry thus attains continually greater importance in our industrial economy. Accelerated growth by price reduction is in keeping with principles which have actuated the industry in the past.

Changing Financial Structure. The chemical industry could not finance its entire postwar plant expansion out of earnings. New expenditures, as much as a billion and a half in 1948, required public financing by a number of companies. This was largely accomplished by long-term loans or new preferred stock.

The resulting increases of senior capital constitute an important postwar change, from the chemical investor's viewpoint. As a common stockholder he weighs the increased earnings leverage against the decreased strength position. The over-all picture with regard to the seven largest chemical companies is set forth in the lower chart, left. To summarize: (1). Hercules Powder has actually strengthened its capitalization by decreasing the ratio of its small issue of preferred stock to its common stock and surplus. (2). Allied Chemical maintains the same sole common stock capitalization. (3). Du Pont has but slightly increased its preferred ratio. All of these three companies are free from funded debt, and the pre-

ferred stock issues of Du Pont and Hercules are of little moment to the common stockholders.) (4). Union Carbide has gone the debt route, instead of preferred stock, but has kept it below 30 percent of its capital structure, paralleling Du Pont's preferred issue. (5). Monsanto's senior capitalization ratio is greater than Carbide's, and now consists of debt as well as preferred. (Although both these companies have increased senior capitalization sharply since 1937, the new situation should cause no concern.) (6). Dow has almost doubled its senior capital ratio to a point which makes the common stockholder stop and look. He cannot, however, be too concerned when earnings cover interest 13 times and preferred dividends almost 5.5 times. But he realizes that Dow common is now more of a leverage stock. (7). American Cyanamid has more than doubled its senior capital ratio, of which the larger portion is debt. Earnings cover interest about 9 times and preferred dividends about 4.5 times. Current interest and dividend requirements are approximately 27 percent of 1947 net income. Cyanamid common has now also more leverage.

The trend toward increased senior capitalization has extended to the medium sized companies as well. Three companies, Victor, Pfizer and Pennsylvania Salt, which in 1937 had common stock only, now support moderate preferred stock issues.

Has this change diluted the customary strong financial position of the chemical companies? Perhaps somewhat in a few companies but over-all very little. From the common stockholder's viewpoint it has multiplied the earning power of his holdings and provided greater opportunity for cashing in on growth. On the other hand he is somewhat more vulnerable to recession cycles and may expect somewhat wider price movements stockmarketwise.

Sales Are Way Up. In view of the moderate rise in chemical prices, the increase in sales volume over the past ten years is impressive. Increases in our chemical group range from 100 to 485 percent and in our drug and pharmaceutical group from 190 to 525 percent, as detailed below:

Chemical Companies	Sales 1937	Sales 1947	Percentage Increase
Allied Chemical	$177,257,000	$365,943,000	100
American Cyanamid	71,993,000	214,581,000	200
Dow Chemical	22,734,000	130,427,000	485
Du Pont	283,800,000	783,405,000	175
Hercules Powder	44,559,000	131,270,000	195
Heyden Chemical	4,614,000	21,912,000	375
Hooker Electrochemical	5,934,000	20,187,000	240
Monsanto Chemical	33,202,000	143,403,000	330
Pennsylvania Salt	10,725,000	29,220,000	175
Chas. Pfizer	6,734,000	39,215,000	485
Union Carbide	169,081,000	521,845,000	210
Victor Chemical	5,731,000	21,302,000	270
Drug & Pharmaceutical Companies			
Abbott Laboratories	9,509,000	59,621,000	525
Allied Laboratories	2,230,000	10,223,000	360
Bristol-Myers	15,453,000	44,655,000	190
Mead Johnson	6,170,000	26,816,000	330
Squibb	18,260,000	68,219,000	275

Even giving effect to peak production by chemical users and the filling of pipelines in the drug and pharmaceutical trade, it would appear that chemical consumption is established postwar on a substantially higher level.

Prices and Profits. The sharp postwar rise in general commodity prices has been watched intently by common stock investors. As usual, following major wars, prices have not risen evenly, and sooner or later should come into more normal balance again.

In contrast to a doubling of the wholesale commodity price index, the rise in chemical prices has been very moderate. From a protective viewpoint the chemical investor views this with great satisfaction, for the chemical industry appears far less vulnerable to a price squeeze than other industries whose prices have risen considerably more.

One test of management is its ability to earn a satisfactory margin of profit on sales. Imposition of the 38 percent federal income tax on corporations imposed an added burden in this respect, and any comparison of postwar profit margins with those of 1937 must take this into account.

Profit margins of course vary considerably among different companies, but the important factor for investors is the trend.

Our group of 12 chemical producing companies (see preceding table) averaged about 15 percent on sales in 1937, and about 11¼ percent after increased taxes in 1947, indicating a somewhat higher postwar operating ratio before taxes.

Postwar rises in costs have been well absorbed to date. Our 12 company group averaged about 11 percent in the first year of readjustment (1946), maintained it during rising costs in 1947 and operated last year at about the same rate. Over-all this reflects management resourcefulness under trying conditions. Three of the companies however have shown a postwar downtrend, while three have trended upward.

In the drug and pharmaceutical group five companies averaged about 14 percent on sales in 1937. They held up well at 12¼ percent in 1946 but last year receded to about 10 percent. Profit margins appear to have held better in the ethical than the proprietary field, and some companies have fared much better than others.

The postwar chemical investor may have to be content with lower profit margins. It is reassuring however that, despite heavy corporate taxes, management in general has been able to maintain profit margins at satisfactory levels.

Earnings and Dividends. When all is said and done the chemical investor glues his eyes on earnings per share, and the trend thereof. This is his prime basis for evaluating stock market prices and his yardstick is the price-to-earnings ratio of comparable securities. Per share 1947 earnings of chemical companies increased substantially over 1937, despite the enlarged burden of corporate taxes, as will be noted from the upper chart, left.

In general the smaller companies showed the largest percentage gains, as might be expected. Of our list, Pfizer leads with a tenfold increase. Heyden gained over 400 percent. Companies more than doubling 1937 per share earnings included Hooker, Hercules, Victor, Monsanto and Dow, in order of gain. Of the big three, Union Carbide leads with a gain of 70 percent.

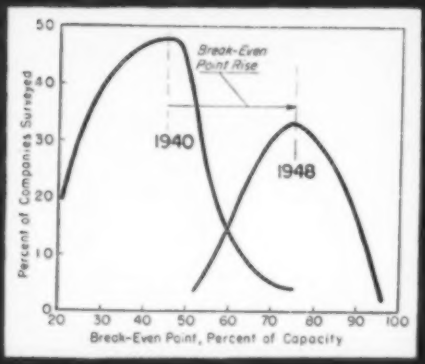
Earnings for 1948, although not yet fully reported, are expected to top 1947. A considerable cushion for further gains lies in the uncompleted expansion program, full benefit of which has not yet been reflected.

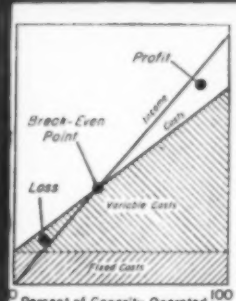
Increased postwar earnings have naturally resulted in higher dividend rates on chemical common stocks. The increased rates, however, have not kept pace with the increased earnings per share.

Chemical investors hold chemical stocks primarily for growth, and appreciate the benefits from plowing back earnings. Perhaps, in view of current expansion programs, they are not too disturbed at the smaller percentage of earnings now being distributed as dividends.

In 1947 our group of chemical companies paid dividends averaging 52 percent of per share earnings, as compared with 76 percent in 1937. Du Pont, Allied Chemical, and Victor paid out from 66 to 80 percent in 1947, but the other nine companies ranged from 34 to 55 percent only.

It is too early to estimate how far capital requirements and debt amortization will continue to dampen dividend payments. However it seems likely that dividends will be more generous in relation to earnings when the current tail-end of the postwar expansion program is completed.





As output from a plant drops progressively lower there finally comes a point at which it begins to lose money—production cost per unit of product goes above the sales price for the product. The point where sales price and cost are equal is called the break-even point. To determine it, divide the costs of a plant into those that vary with production and those which are fixed. Then graph them as shown. As long as your plant operates above the break-even percent there will be a profit.

R. S. Aries

R. S. Aries Associates, Brooklyn, N. Y.

■ DESPITE the record profits which the chemical process industries had had in recent years,* chemical managers have not substituted complacency for their usual alertness. Few of them forget the hidden threat to profits in the sharp rise in the break-even point of their business—the sales volume which marks the dividing line between profit and loss. As a result of changes during the last seven "fat" years much higher sales and a greater volume of production are required to produce income sufficient to balance expenses. Break-even points have been a topic of discussion for some time. Up to now they have been considered as primarily of academic interest in view of a seller's market. But what of the future?

Balance sheets and income statements give information about a business for one particular time or period. However, they do not show what would happen to profits if the rate of production should change. From the standpoint of analysis and control, it is of considerable advantage to be able to depict the effect of a change in production rate. That is just what a break-even chart does (See left.)

To determine the status of break-even points in the chemical process industries in 1948 and compare them with equivalent figures for 1940, about 200 companies considered representative were contacted by a questionnaire for data on their break-even points. Most of the companies were of medium or large size, with their officers listed in "Poor's Register of Directors" in 1948. No identification was required. The questions asked also included increases per unit of product in fixed costs, raw materials, labor, sales price, output and cost of new plants.

It is not difficult to establish the break-even point for a single, one-product business. This, unfortunately was not the case with the bulk of the companies investigated. Thus the answers should be considered as tinted with some opinion, even though expressed by people who were in a position to "know the answers." They do not necessarily tally with official statistics, but are generally reliable, in view of the fact that they are considered to be the "voice of industry."

It is considered an important and ominous finding of the survey, that in most cases, management neither knows exactly the break-even point of its company, nor understands its meaning. It sounds paradoxical that management does not know how much of its profits are due to performance and how much to volume. Our entire economic system revolves around profits, yet chemical management seems to be rather unaware of their interrelationship!

The median break-even point of the companies surveyed was less than 50 percent of capacity in 1940. This good performance was probably due to the increased sales in that year over the average of the 1930's without an appreciable increase in costs. The estimated break-even

* Aries, R. S. "Profits in the Chemical Industries" *Chem. Eng. News*, **26**, 3550 (1948).

point in May 1948 was slightly under 80 percent of capacity, or an increase of almost 60 percent in seven years!

Current high earnings largely depend on a record sales volume at attractive price levels. Profits are high, because production or prices are high, or both—not because costs are lower. Thanks to record demand, high production, and high prices, dollar sales volume of surveyed companies shows an impressive gain since 1940. On the average, it is up nearly 150 percent. But all costs are up as well, and practically all companies studied report a sharply higher break-even point.

A higher break-even point, compared to prewar, is obviously not a danger sign in every case. For instance, a chemical company that spends money in establishing a new product on the market will probably be raising its break-even point, but doing so intentionally in the hope of ultimate gain.

But for many, and probably most companies, a rising break-even point is a signal for management, a warning that a remedy should be sought promptly. In a few cases, today's record volume of production and sales is abnormal, resting uncertainly on pent-up demand and inventory replacement. Then, too, many companies face declining prices for their product as competition runs high.

A drop in sales volume of any size can quickly reduce income to a point where today's higher break-even point squeezes out the profit. A drop in selling price can actually increase the break-even point further, unless unit sales score an impressive rise at the same time. The sales volume needed to break even can be roughly measured by two convenient yardsticks.

First is the ratio of variable expense to sales. The bill for materials, labor and other costs that vary with production determines how much of the sales dollar is left to cover overhead and provide a profit. In simplest terms, if for every dollar item sold, 60c. goes to meet variable costs, 40c. of marginal income remains to pay the bill for depreciation, property taxes, essential maintenance, fixed salaries, etc., and to furnish the profit.

If the ratio of variable expense to sales increases, it will take more sales to provide the total dollars required to cover overhead and maintain profits. This seems to have happened to many companies. The percentage increase in labor and materials cost, in the case of the chemical process companies studied, is probably greater, on the average, than the percentage increase in selling price. There is less of each sales dollar, therefore, left after variable costs to be applied to overhead and profit, even though the number of sales dollars is at an all-time peak.

Another yardstick for determining break-even point is, of course, the bill for fixed expenses. When this rises, it takes more sales dollars to yield enough marginal income, after variable costs, to cover fixed costs and leave a profit. Once again experience of the chemical process companies cooperating in the survey strikes a warning note. Every reply indicates an increase in fixed expense with an average rise of some 35 percent over prewar.

The drastic effects on profits of this double squeeze are partly concealed so long as sales volume scrapes the ceiling, but let sales decline or prices be squeezed—and watch out. Some companies already feel the pinch. One medium-sized company commented "We have raised sales price to a ceiling where further increases would price us out of the market. We must look elsewhere for relief."

Another company reported that "Sales have increased greatly, but cost of materials, labor, and fixed expense have increased out of proportion. Meanwhile, the high price of our product (over which we have no control, owing to materials costs) is beginning to affect sales. Our product being produced on a large scale, when price gets out of line it affects sales considerably. The answer is to get costs down, get selling prices down, to increase volume."

The president of a good sized company made this revealing comment: "We have to sell hard today. Our honeymoon is over and competition is pushing prices down."

Most chemical process companies, fortunately, are not caught up in a swift current of declining prices and sales. There is time for advance planning and curative action before, rather than after, a profit-eating, high break-even point gets out of hand. Moreover, chemical managers in industry are driving hard on all fronts to increase sales, widen profit margin, and get today's swollen costs in hand. A typical comment: "Our first choice, increasing sales, is determined by the relationship of fixed cost to profit margin. We can handle additional volume with very little increase in fixed costs, and we are going after it. Our second choice, improved processes is the result of experience. We've found that benefits from new processes and methods are tremendous even though some of the latter, such as employee relations, working conditions, quality, sometimes seem rather intangible. The fact is they do affect profit margins."

A small fine chemical company has a different reason for stressing increased sales. In the words of its manager, "We can only improve processes if we increase volume and permit workers to stay on one job rather than do several, as now."

The average company might expect to find that capacity is about double prewar; pay roll per unit of production has increased over 100 percent over 1940, and dollar sales are up three times. It's well to keep in mind that this is a report on conditions as of May 1948. When these same companies put their plans to work to improve methods, equipment and increase sales, their unit costs are nearly certain to slide down. The average may, and probably will, drop sharply in 1949 as knots in delivery vanish, as new equipment arrives, as extra costs in overtime, pressure output, are cut.

Better service, more intensive selling, and restoration of normal discounts will combine to make selling costs harder to drive down; will put even more pressure on management to hammer at production costs and lift sales volume to the highest level. With the large increase in sales, it is not surprising that most companies report an increase in marginal income in 1948, despite greater variable costs and an increase in the ratio of variable cost to sales. The ones that now show lower marginal income than prewar are extremely vulnerable indeed to any drop in sales or price. It means that their ratio of variable cost to sales has moved up sharply and that their break-even point is close to, if not equal to, current volume.

Among the cures for the situation indicated by the respondents of the questionnaire, were increase in capacity, improved methods and equipment, new products and increase in the sales price. It is also known from the work of the author that prudent management also does careful market research, cost and efficiency studies of administration, overhead, supply and price of raw materials and commerical chemical development in general.

If sales of the chemical process industries start falling off this year, as they may do in some instances, many managers will face a decision that only an unlucky few have had to make since the end of the war.

This decision is: whether to bring supply and demand into balance by cutting production or by cutting prices.

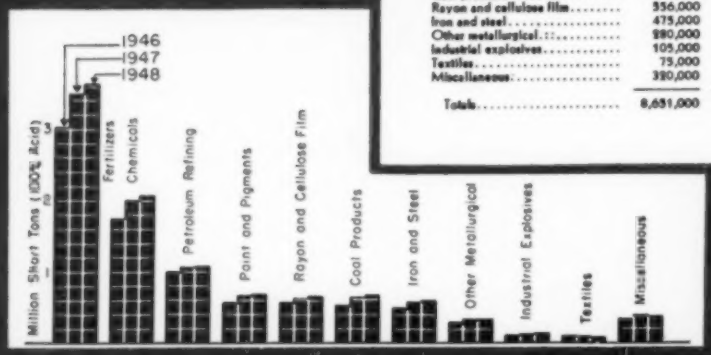
The easier decision is to cut production. Product inventories begin to drop right away, and the drain of cash into materials and wages stops as promptly. It's comfortable,

(*Continued on page 128*)

U. S. Sulphuric Acid Consumption

Short tons, 100 percent acid

Consuming Industries	1946	1947 Revised	1948
Fertilizers	3,080,000	3,515,000	3,650,000
Chemicals	1,760,000	2,000,000	2,070,000
Petroleum refining	1,000,000	1,065,000	1,070,000
Paint and pigments	550,000	665,000	680,000
Coal products	510,000	640,000	650,000
Rayon and cellulose film	356,000	610,000	650,000
Iron and steel	475,000	550,000	570,000
Other metallurgical	280,000	315,000	315,000
Industrial explosives	105,000	125,000	130,000
Textiles	75,000	73,000	70,000
Miscellaneous	380,000	372,000	370,000
Totals	8,651,000	9,930,000	10,225,000



SULPHUR & SULPHURIC ACID

■ STILL the bellwether of the chemical industry, sulphuric acid hit another peak in 1948, which brought with it some surprises in plant construction and in sulphur production that even the most foolhardy would not have predicted a couple of years ago. In the three postwar years, almost 2,500,000 annual tons of capacity (100 percent acid basis) has been added, of which about 750,000 tons went into operation in 1948. Scheduled for 1949 is another 975,000 tons. To a small extent these figures are offset by the abandonment of old chamber plants, but it appears nevertheless that present nominal capacity is close to 12,000,000 tons and will be almost 13,000,000 by the end of this year.

Our estimates of activity in sulphuric acid and its raw materials, based on 10 months Census data and trade opinions, show some fairly minor percentage changes which still account for many tons. A 3 percent estimated rise in acid produced means 290,000 tons, which is the approximate amount by which 1948 bettered the preceding year. And in spite of the widespread belief that the 1948 boom is now leveling out, we predict a further increase of 120,000 tons for 1949, bringing a total of 10,370,000 short tons in comparison with the 8,659,000 tons of 1946, the 9,960,000 tons of 1947 and the 10,250,000 tons of 1948.

Where Acid Came From. Since we estimate that the total of acid from smelters, from pyrites, and from hydrogen sulphide actually declined slightly in comparison with recent years (see tabulation), the extra load for acid making fell entirely on brimstone. The results were two-fold: Not only did sulphur mining increase by an estimated 8½ percent compared with the largest previous year, 1947, but producers stocks fell to the lowest levels in many years. Sulphur production, which included the output of a new mine in Texas, is estimated at 4,820,000 long tons, compared with 4,441,214 tons in 1947 and 3,859,642 tons in 1946. Exports of sulphur were at about the level of the 1,299,060 tons of 1947, or possibly just slightly below, but domestic shipments totalled some 3,650,000 tons, an increase of 25 percent over 1946 and 3 percent over 1947.

Sulphur going into applications other than acid is believed to have increased some 10 percent in 1948, for the first time reaching a total of about 1,000,000 tons. Thus, over 2,600,000 tons of sulphur was available for acid, and accounted for some 8,250,000 tons of the estimated acid total.

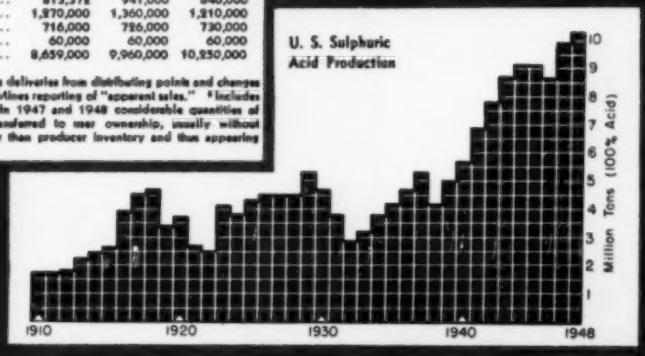
Acid produced from sources other than sulphur was just slightly less than in 1946, and about 7 percent below 1947. Pyrites imports are estimated at 115,000 long tons, compared with 182,893 tons in 1946 and 126,553 tons in 1947. Consumption of domestic pyrites, estimated at 840,000 long tons, was slightly ahead of the 813,372 tons of 1946, and considerably below the 941,000 tons of 1947. Acid from H_2S remained at about 60,000 tons but may be expected to increase in 1949 as one and perhaps two new H_2S-using plants come in.

Among sulphur sources shown in the tabulation is about 40,000 tons of elemental sulphur produced from fuel gases. This quantity, out of a potential of about 50,000 tons now installed, will increase considerably in 1949 and 1950. New elemental sul-

U. S. Sulphur Activity and Sulphuric Acid Production

(Sulphur and pyrites in long tons; Acid in short tons, 100 percent)	1946 Revised	1947 Revised	1948[1]
Sulphur mined	3,859,648	4,441,214	4,820,000
Sulphur exports	1,189,078	1,299,060	1,300,000
Domestic shipments[2]	2,905,119	3,540,485	3,650,000
Approximate mine stocks, Dec. 31	2,200,000	2,800,000	2,600,000
Sulphur recovered from fuel gases[3]	35,000	40,000	40,000
Users' stock changes	−10,000	+190,000[4]	+70,000[4]
Non-acid uses of sulphur	830,000	910,000	1,000,000
Sulphur available for acid	2,100,000	2,480,000	2,690,000
Acid from sulphur	6,688,000	7,814,000	8,250,000
Pyrites imports	182,893	126,553	115,000
Domestic pyrites	813,378	941,000	840,000
Acid from pyrites	1,270,000	1,360,000	1,210,000
Acid from smelters	716,000	736,000	730,000
Acid from hydrogen sulphide	60,000	60,000	60,000
Total sulphuric acid made	8,659,000	9,960,000	10,250,000

[1] Estimated from 10 month's figures. [2] Includes deliveries from distributing points and changes in consignment stocks to agree with Bureau of Mines reporting of "apparent sales." [3] Includes sulphur imports, negligible in recent years. [4] In 1947 and 1948 considerable quantities of sulphur carried at consuming points were transferred to user ownership, usually without shipment, thus becoming user inventory rather than producer inventory and thus appearing in "apparent sales."



phur recovery plants now being installed, or projected for the near future, are estimated to total about 120,000 tons per year capacity, from both refinery and natural gases. The 50-ton per day Simon-Carves plant of Hancock Chemical Co. will shortly go into operation near Los Angeles on H_2S-bearing gases from three refineries. Two projected plants to operate in Wyoming on natural gas will have a potential of about 270 tons total per day, with another small H_2S plant being considered in the Philadelphia area for perhaps 25 tons per day.

During the year American Smelting & Refining Co. started up a new 20-ton per day liquid SO_2 unit at its Selby (Calif.) smelter. Canadian International Nickel is reported to be working with Canadian Industries Ltd. on a project to use oxygen smelting of nickel ores at Copper Cliff, thus obtaining a strong SO_2 which can be readily concentrated and liquefied to yield some 42,000 tons per year. The idea will be to supply SO_2 to sulphite mills.

Where Acid Went. Such a large acid production was consumed without difficulty. Acid was rarely short, and little of it went begging. Some difficulty was reported in securing tank cars but in the main the situation was well in balance. Most of the consuming industries showed small to moderate increases, as another accompanying tabulation makes clear. As might have been expected, largest increases were in fertilizers, chemicals, rayon and steel pickling, with moderate increases in use by the petroleum, coal products and pigment industries. A slight drop was experienced in the textile field. Acid use fell behind the trend in petroleum refining owing to the virtual replacement of alkylation by fluid catalytic cracking.

It is, of course, anybody's guess where acid will go in 1949. Although the general economy will probably decline slightly, many of the larger uses of sulphuric acid can be expected to do a little better than in 1948. Superphosphate will probably register a slight decline, and use in petroleum a minor increase. Chemicals, coal products, pigments and textiles can all be expected to hold their own or increase slightly, with substantial gains in steel pickling and in rayon.

Projecting the 1948 consumption tabulation to 1949 we arrive at something like this, in thousands of short tons:

Fertilizers	3,600	Ind. explosives	125
Chemicals	2,100	Rayon, film.	700
Petroleum	1,055	Textiles	75
Coal products	690	Iron, steel	620
Other metals	315	Miscellaneous	870
Paints, pigments	690	Total	10,370

What to Watch in '49. Several interesting ideas that had their inception in 1948 or earlier may be worth watching in 1949. One is a new acid use—the neutralization of alkaline soils in the West, which could eventually become a sizable factor. Probably 10,000 tons was used in 1948, either sprayed directly on the soil or added to irrigation water.

Other developments that will bear watching include new sludge acid recovery systems, and renewed interest in spent pickle liquor recovery. Monsanto announced a low-temperature sludge acid system which was employed in two plants on alkylation spent acid during the war and is being

(*Continued on page 115*)

U. S. Caustic Production, Tons

Year*	Lime-Soda	Electrolytic	Total
1921	163,044	75,547	238,591
1923	314,195	122,424	436,619
1925	355,783	141,478	497,261
1927	387,235	186,182	573,417
1929	524,985	236,807	761,792
1931	455,832	203,055	658,887
1933	439,363	247,620	686,983
1935	436,980	322,401	759,381
1937	488,807	479,919	968,726
1939	532,914	498,132	1,025,046
1940 (est)	505,000	595,000	1,100,000
1941	685,999	743,316	1,429,310
1942	634,291	939,878	1,514,169
1943	663,495	1,036,577	1,700,072
1944	689,565	1,205,039	1,894,604
1945	734,993	1,129,312	1,864,305
1946	742,932	1,129,956	1,872,888
1947	747,932	1,386,995	2,134,242
1948 (est)	767,000	1,573,000	2,340,000

* Figures for 1921–1947, except 1940 are from the U. S. Bureau of the Census. Prior to 1939 electrolytic caustic soda figures did not include that made and consumed at woodpulp mills, estimated at about 20,000 tons in 1927 and 1929, at about 24,000 tons in 1931, 21,000 tons in 1933, 20,000 tons in 1934, 17,000 tons in 1935, 19,000 tons in 1936 and 1937, and 18,000 tons in 1938.

Soda Ash Consumption, Short Tons 100% Na_2CO_3

Consuming Industries	1946	1947 Revised	1948
Glass	1,400,000	1,440,000	1,370,000
Soap	120,000	135,000	127,000
Caustic & bicarbonate	1,128,000	1,127,000	1,137,000
All other chemicals	910,000	1,030,000	1,030,000
Cleansers & modified sodas	125,000	130,000	135,000
Pulp & paper	190,000	220,000	230,000
Water softeners	90,000	100,000	110,000
Petroleum refining	20,000	22,000	24,000
Textiles	77,000	71,000	69,000
Non-ferrous metals	140,000	190,000	210,000
Exports	67,000	107,000	230,000
Miscellaneous	223,000	228,000	208,000
Total	4,490,000	4,800,000	4,880,000



Caustic Soda Consumption, Short Tons 100% NaOH

Consuming Industries	1946	1947 Revised	1948
Soap	90,000	110,000	103,000
Chemicals	415,000	470,000	530,000
Petroleum refining	150,000	160,000	170,000
Rayon & transparent film	408,000	455,000	500,000
Lye & cleansers	115,000	120,000	130,000
Textiles	108,000	105,000	105,000
Rubber reclaiming	26,000	27,000	26,000
Vegetable oils	18,000	20,000	22,000
Pulp and paper	115,000	130,000	140,000
Exports	61,000	138,000	185,000
Miscellaneous	364,000	395,000	422,000
Total	1,870,000	2,130,000	2,333,000



■ **Alkalis** entered the buyer's market toward the end of 1948, but this does not mean that the year did not establish records in all the industry's principal products. Nor does it mean necessarily that 1949 will not create a few records of its own. Although a peacetime pattern of consumption is now being reestablished, which may mean a little slackness during the first few months of this year, the industry is expecting that later months will more than offset any loss and show a net gain of a few percent for the year.

During the early part of 1948 all of the alkalis were tight but, as the year wore on, only caustic soda remained so. Even caustic loosened up by the year end, so that the export controls that had previously been in force were relaxed to a virtual vanishing point. Even with the controls, exports were considerably above any previous year and would have been larger if domestic demand had permitted it. New capacity for soda ash, chlorine and caustic all came in before the year was over and more will be available during 1949. Since the export needs are likely to slacken as European alkali capacity continues to expand, it seems probable that a moderate increase in demand can be met without difficulty.

Statistics of the year, estimated in the main from 10 months' production data, show that soda ash production increased slightly less than 2 percent, from the 4,800,276 tons made in 1947, to about 4,880,000 tons in 1948. This total comprised about 4,565,000 tons of ammonia soda, and 315,000 tons of natural soda, compared with the 1947 figures of 4,519,144 tons and 281,132 tons respectively. Quite a little production was lost due to strikes in alkali plants and in the coal fields. As an offset, production was at the rate of 5,150,000 tons per year during the last month for which figures are now available.

On the consumption side, the trends among consuming industries were mixed, some being up, others down. Glass industry consumption was off slightly due to a slow year in containers, while soap began to lose ground to the detergents and showed a decreased ash usage of about 6 percent. There was little if any change in lime-soda caustic, bicarbonate and other chemicals, with moderate increases in cleansers and modified sodas, water softeners, pulp and paper and petroleum refining. While nonferrous metals showed a considerable increase and textiles a small decrease, the export market took more than twice the amount required in 1947. These changes are indicated in an accompanying chart and tabulation.

In the caustic soda picture the increases were somewhat more emphatic. Total caustic is estimated to have reached 2,340,000 tons in 1948, compared with 2,134,242 tons in 1947. This increase of nearly 10 percent included some 1,573,000 tons of electrolytic caustic, and 767,000 tons of the lime-soda product, the latter itself a record. These data compare with 1,386,995 tons and 747,247 tons, respectively, in 1947. Only bicarbonate decreased, with an estimated 163,000 tons in 1948, compared with 181,145 tons in 1947.

Caustic consumption, estimated to have totalled about 2,333,000 tons, was made up of increases in all principal consuming industries except for rubber and soap. Considerable increases were contributed by the chemicals group, together with rayon, lye and cleansers, and exports. Smaller increases came about in petroleum refining, pulp and paper, and miscellaneous uses.

Chlorine production increased by nearly 12 percent, a larger rise than that of total caustic, but somewhat less than the percentage increase of electrolytic caustic. Estimated to have totalled 1,615,000 tons, composed of 1,405,000 tons made with electrolytic caustic soda, and 210,000 tons from non-NaOH sources such as caustic potash, metallic sodium and the Solway nitrosyl chloride process, the comparable figures for 1947 were 1,446,865 tons total, broken down into 1,240,000 tons with NaOH, and 206,000 tons for non-NaOH sources. Chlorine exports were small and the domestic requirements were generally met without difficulty. The distribution of chlorine changed little from that of 1947 and was probably about 75 percent for chlorinated compounds, 12 percent for pulp bleaching, 10 percent for water treatment and other bleaching, and 3 percent for textiles, miscellaneous uses and exports.

Where From Here? Despite the dangers of prognostication at a time when the over-all trends of 1949 are certainly not clear, we feel that alkalis will increase slightly, perhaps by about 2½ percent for soda ash, and about 4 percent for caustic and chlorine. We realize that some of the European markets gained in the last two years may not be held and that European competition may in fact eat into our new-found South American business. Still, exports should increase slightly for this year if the necessary dollars can be found, while there is a good chance for holding ground and even some light gains in the domestic picture. To sum up 1949 expectations for ash, in thousands of short tons, the picture may well be like this:

Glass	1,400	Water softeners .	110
Soap	130	Pet. refg. ...	25
Caustic, bicarbonate	1,150	Textiles	70
Other chemicals..	1,045	Non-ferrous metals ...	230
Cleansers, etc.	135	Exports	250
Pulp, paper..	235	Miscel.	230
		Total ...	5,000

Similarly, for caustic soda, the consuming trends may be about as the following table shows, also in thousands of tons:

Soap	103	Rubber reclaiming.	27
Chemicals ..	550	Vegetable oils	25
Petroleum refining ...	180	Pulp, paper..	160
Rayon, film..	540	Exports	200
Lye, cleansers .	130	Miscel.	400
Textiles	105	Total ..	2,420

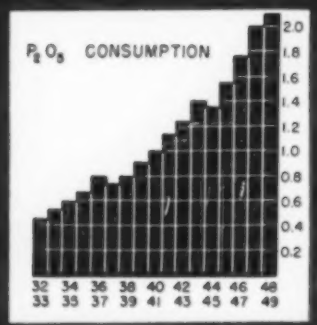
And the Trends. Aside from the trends already noted, several are worth noting here. One is the increasing interest in the mercury cell as a source of pure caustic without special purification. It is believed that nearly 10 percent of the electrolytic caustic is now so made, compared with very little before and during the war. Another movement, that might be called a trend, is the continued interest in finding an economic process for converting waste hydrochloric acid into chlorine. Several possible processes have been discussed, but none as yet appears to be imminent. Finally an important change in caustic use should be mentioned. Soap is already feeling the impact of the synthetic detergents, and this impact will be much greater as time goes on. But this does not mean a loss of caustic use since something like 10 percent of the weight of active detergent material produced will be caustic.

Sulphuric Acid

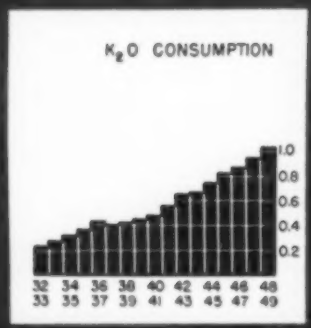
(*Continued from page 113*)

considered for several new installations at present. Chemical Construction revamped the decomposing portion of its sludge acid system and is installing it in the original plant of this type, at Petrolia, Pa. So far as pickle liquor is concerned, extra pressure on the stream pollution problem is accelerating efforts toward a solution and two novel processes still under wraps in the advanced research stage may come into the open in 1949.

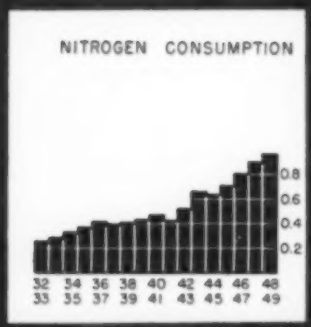
One more technical possibility worth watching is the use of oxygen sulphur burning, with a closed cycle, as in a unit at Trail, B. C., described in this review a year ago. Several producers are considering this process despite difficulties of general application, partly for the capacity increase (six times at Trail), but chiefly because such a plant has no tail gases.



P_2O_5 SUPPLY	Thousand Tons 1947-48	1948-49
U. S. Production	2,025	2,145
Normal super	1,747	1,835
Conc. superphosphate	191	215
Wet base goods	12	12
Other	75	83
Imports	35	35
Nitrogenous phosphatic materials	30	30
Mixed fertilizers	5	5
Exports	60	70
Normal super	37	50
Conc. superphosphate	11	12
Nitrogenous and phosphatic materials and mixed fertilizers	12	8
Net Supply	2,000	2,100



K_2O SUPPLY	Thousand Tons 1947-48	1948-49
U. S. Production	955	1,060
60% muriate of potash	750	835
50% muriate of potash	65	73
Organic and byproduct materials	90	90
Manure salts	45	50
Sulphate of potash and sulphate of potash magnesia	75	82
Imports	95	95
Exports	60	65
Canada	43	46
Cuba	5	5
Other countries	12	14
Net Supply	990	1,090



NITROGEN SUPPLY	Thousand Tons 1947-48	1948-49
U. S. Production	748	814
Ammonium sulphate	206	220
Ammonium nitrate	131	134
Other nitrogenous solids	60	70
Nitrogen solutions and ammonia for ammoniation	281	257
Ammonia for direct application	37	43
Natural organic	30	30
Army production	3	58
Imports	205	202
Canada	98	88
Chile	103	106
Other	4	8
Exports	65	61
Net Supply	888	955

■ FERTILIZER chemical trends are uncertain. If one were to ask a dozen experts, one would probably find them about equally divided among three opinions. Some would forecast shortages with a seller's market. Others would be equally sure that small surpluses are about to establish a buyer's market. Others would believe that the balance between supply and demand is going to be excellent during the coming year. And all would be right.

Nationally there is probably a very close balance between supply and demand for 1949 in the case of all major fertilizer chemicals and for mixed fertilizer. But there will be some surpluses in certain areas. Southwestern states like Arizona and New Mexico, like certain South Atlantic States and New England, will experience definite shortage of certain fertilizer components, particularly nitrogen. But in other areas there will be surplus of fertilizer nitrogen. For example, from Kansas and Iowa to Louisiana and Texas there is a definite region in which more nitrogen chemicals are available than can readily be sold locally.

Farmers' buying power was never greater. Last year the income of American agriculture above costs exceeded $30 billion. This means that the ability and desire to buy fertilizer was probably never greater. Furthermore, planting expectations give promise of another (1949) near-record crop. But supplies of nitrogen, phosphate, and potash are all comparatively generous. This means an excellent year in magnitude of business for everybody connected with the fertilizer enterprise.

Tables and charts which accompany this discussion come from a recent Department of Agriculture report entitled "The Fertilizer Situation for 1948-49." That report is very satisfying in both completeness and dependability. It can safely be used by chemical enterprise in appraisal of and planning for participation in this industry's activities. There is no doubt as to the correctness of its most important conclusion. The consumption of all types of plant food during the past year again established a record. And this is the tenth successive year in which farmers have purchased and used more fertilizer materials than in any previous season. This fact has contributed importantly both to the productivity of agriculture and its phenomenal net income.

Phosphate. Production during the current fertilizer year will supply 2.1 million tons of P_2O_5, an all-time record. If farmers want a still greater supply

for the next fertilizer year, which begins in July, they can have it. The industry has a sufficient supply of rock, enough sulphuric acid, and an abundant processing capacity in existing works. Even the transportation situation favors further expansion of superphosphate to meet every need of the farmers.

It is notable also that the capacity of plants making high concentration superphosphate is continuing to grow significantly. At the first of 1949 these plants were in position to manufacture at a rate of approximately 20,000 tons of P_2O_5 per month in concentrated super and still more capacity is nearing completion. At least a further 10 percent increase can be expected in the rate of production if demand continues to grow, as most of the dozen firms active in this business seem to expect. None of this growth in making high concentration phosphate has been at the expense of normal super.

Perhaps superphosphate will be the first of the major plant foods to become surplus and create a buyer's market. There is at the year end slight evidence that this is true in a number of important areas. The government asked for bids on approximately 60,000 tons of normal superphosphate for its demonstration and soil improvement use. For the first time in many years the offers exceeded the government's need. In fact, more than six times as much was offered on bids as Uncle Sam has expected to buy.

One slight economic difficulty has been noted recently. There has been considerable difficulty in getting ammonia or ammonia solutions for ammoniation of superphosphate at producing plants. This is causing some slight difficulty and the building up of larger-than-wanted stocks on hand at these superphosphate works. The precise cause of the difficulty varies locally. It appears that the condition is temporary, and that movement of mixed fertilizer and superphosphate to consuming areas will not be unduly delayed this spring.

Potash. Supply for industry and agriculture continues to grow steadily. More than a million tons of K_2O is being used this year in the fertilizer consumed in the United States. Dependable estimates indicate that slight further increase may be expected during the fertilizer year which will begin in July.

Most of the increase in potash supply has been accomplished by plant improvements of domestic producers. Some definite enlargements have been completed during last year and will function regularly from now on. But a significant part of the increased output has come through skilled engineering which had widened the bottlenecks here and there throughout the plants, permitting regular operation at rates never before feasible.

Several industrial enterprises have been exploring the possibility of entering this business. It is a reasonable expectation that one or two of these firms will become permanent members of the industry within the next few years. As yet potash imports have not reached a level which at all discourages such expansion. It is, of course, possible that European producers urgently needing dollars may step up imports into the United States a few years from now. But the urgent need of Europe and the Far East for all the potash which can be mined in Europe and the Near East indicate that America will probably for some time to come be in effect just about self-sufficient in its supply of potash for both industry and agriculture.

Nitrogen. Supply for industry and agriculture continues more abundant than ever before. Small increases in byproduct production and substantial expansion of synthesis of ammonia combine to meet constantly growing needs for chemical nitrogen without cutback on nitrogen for fertilizer. Some of these industrial needs for nitrogen compounds have been growing in a way that has confused the statistical record. Market analysts find difficulty in determining where a substantial tonnage of nitrogen is going in industry. Some of the best estimates show a disappearance into industry of nearly 100,000 tons per year of nitrogen which can not be accounted for by known uses. Perhaps a quarter of this has gone to serve increased activity of conventional users. But the market flow of the rest remains something of a mystery.

One of the most surprising, because least suspected, of the factors in the ammonia business at the year end has been a change which seems at first glance to have no relationship to the nitrogen business. It is the determination by the Secretary of Agriculture of sugar requirements for Continental United States in the calendar year 1949. That action under Sugar Act of 1948 has, however, an important significance for several divisions of chemical enterprise. This is the way it goes.

By restricting sugar imports from Cuba through the quota system, a substantial increase in molasses supply is created there. This is rapidly increasing the activity of numerous fermentation divisions of industry with an added output of about 30 million gallons of unexpected ethyl alcohol. That material has relieved expected shortages in the anti-freeze market. The dropping price is certainly going to hit methanol for anti-freeze applications very severely for the next cold season. Some who expected to enter profitably into methanol making find that conversion of synthesis units from ammonia to methanol is not going to be as profitable as was thought likely only a few months ago. Thus the effort of Uncle Sam to control sugar price is producing substantial, almost alarming, shifts in alcohol, anti-freeze, and methanol business. It may represent the creation by next fall of a definite surplus of both anhydrous ammonia and methanol.

Adequate supply of fertilizer nitrogen does not mean that the nitrogen chemicals have been in the desired form. There continues to be a significant scarcity of ammonium sulphate, despite a more than ample supply of anhydrous ammonia from which it might be made. This scarcity applies both to mixed fertilizer and to sulphate wanted for separate use as top-dressing material. At the year end there were either operating or approaching readiness to operate approximately a dozen establishments for converting anhydrous into sulphate. Also coke works were very actively accomplishing this result by injecting gaseous ammonia into the crude gas ahead of the saturators. By that means during 1948 there was made at least 60 million pounds of sulphate, the ammonia for which came from synthetic works. The limit on this conversion appears to depend primarily on the ability of saturators and centrifuges to handle more sulphate per year.

By the end of 1949 it is expected that conversion of anhydrous at coke works and manufacture at chemical plants designed especially to make sulphate would account for at least a million tons per year of sulphate of ammonia capacity. If so, the direct production from anhydrous would then exceed the production of sulphate as a byproduct of coal processing. This means, of course, that when nitrogen surpluses develop, there will be intense competition between oven operators and chemical manufacturers of sulphate to reach the then limited market. That, it is reasonable to expect, will in turn hit the ammonium nitrate business very harshly. The effect on Chilean nitrate will also be unfavorable. Over-all there will be a severe inter-commodity competition at that stage, perhaps beginning a year or two from now.

COAL CHEMICALS

In the future's market, xylene, toluene, [illegible] sulphate, benzene, creosote and tar products.

Products From Coke Oven Operation

	1947	1948 Prelim.	1949 Est.
	Million Tons		
Coal charged	94	97	100
Coke produced	67	69	71
Breeze produced	5.5	5.6	5.7
	Million Gal.		
Tar	736	750	780
Crude light oil	255	260	270
Ammonium sulphate	Thousand Tons		
From coal	810	830	850
From synthetic NH_3	10	30	40
In liquor	100	100	100
	Billion Cu. Ft.		
Oven gas	910	990	1,030

Benzene Balance Sheet

1948	Million Gal.
Production	160
Imports	3
	163
Requirements	163
	Balance
1949	
Production	160
Imports	3
	165
Requirements	183
Deficit	−18

■ So-called "coal chemicals" used to come wholly from coal. Now that source is inadequate, and petroleum is an important source. But one still thinks of this group of compounds under the old designation. All still come to a large degree from one or several of the primary products of coal carbonization—coke, tar, gas, light oil, and ammonia.

With a brief coal-strike exception in April, the capacity of coke ovens has been during 1948 the limiting factor in rate of coke making. Despite that brief interruption, 1948 has established an all time record output of approximately 58 million tons of oven coke, with almost a normal ratio of co-products. The increase in byproducts over 1947 was only 2 percent, whereas the coal processed and coke made were up 4 percent. Poor quality of coal used at the time of the coal strike accounts for the slightly lower relative yield of chemicals.

With the completion of a few new and remodelled ovens, which have increased the capacity of the industry recently, it is expected that 1949 will provide a slightly greater output of all of these primary products.

Ammonia production during carbonization continues to furnish most of the ammonium sulphate and all of the crude ammonia liquor used by industry. The sulphate made at oven plants during 1948 represented by a wide margin an all-time record for the industry of approximately 1.72 billion pounds. In addition, the ammonia content of liquor made was approximately 50 million pounds, equivalent to 200 million pounds of sulphate.

Increase in output of sulphate as compared with 1947 was approximately 5 percent. Of this nearly half came from increase in coal treated. The other half, about 60 million pounds, was made by injecting gaseous synthetic ammonia into the gas stream ahead of the saturators, thus converting the anhydrous to a more marketable form as solid ammonium sulphate.

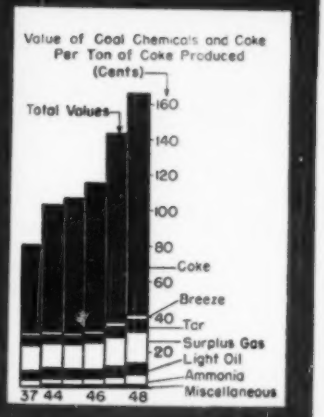
Whatever may develop in the future in the way of ammonia supply from coal carbonization, it is evident that the supply of synthetic ammonia will wholly overshadow this byproduct supply. And yet the demand for ammonium sulphate, instead of liquid anhydrous ammonia, will probably for a few years to come continue to provide a small premium price to the sulphate maker. (Relationship of these ammonia derivatives to each other and to the fertilizer industry discussed on pp. 116-117.)

Crude light oil stripped from oven gas formerly supplied practically all benzene, toluene, xylene, and solvent naphtha. These important aromatic coal chemicals still come in large measure from coke ovens or from tar distillation. But petroleum is now far more important as a source of xylene, and also slightly more important than coal in furnishing toluene. As yet the production of benzene from petroleum has not achieved an important place in that division of the coal-chemical business.

Reliable estimates of total output of xylene and toluene during 1948 indicate a production of 63 million gallons and 76 million gallons respectively. Of these amounts 55 million gallons of xylene and 44 million gallons of toluene are estimated to have come from petroleum. Manufacture of these heavier aromatics is an important byproduct part of the aviation-gasoline business. These particular members of the aromatic series can readily be separated, and so can be supplied adequately to meet domestic demand.

A basic question is whether the aviation gasoline manufacturer can get a sufficient price for them to justify separation and refining. Fortunately for the coke oven operators this price is sufficiently high that it does not unduly discourage almost complete recovery from both light oil and such tar as is either topped or refined. It does mean, however, that chemical enterprise need no longer worry about getting a sufficient supply of both toluene and xylene unless a new demand should develop for TNT.

Benzene production in 1948 was approximately 158 million gallons. This did not by any means satisfy the desire of the chemical industry, nor will the slight increase expected in 1949 be at all likely to do so. It is technically possible to recover from petroleum refining any desired grade of benzene;



but it is by no means economical to do so at present. Furthermore, the desire of the aviation-gasoline maker to keep all aromatics in the gasoline sold for air use is even more intense with respect to benzene than for other aromatics. Furthermore, the recovery of benzene from the gasoline stream is technically more difficult and definitely more expensive per gallon than for either of the two heavier aromatics whose recovery has already become so important.

There seems to be an almost unlimited demand for benzene of both industrial (2°) and nitration (1°) grades. A trifle over 100 million gallons of industrial grade and 45 million gallons for nitration was made last year. Motor fuel got less than 10 million gallons, according to best estimate, whereas in prewar years this outlet always was counted on to take the bulk of the benzene recovered from light oil. The point has now been reached that the chemical demands are so great that the motor fuel manufacturers will get almost no benzene from the coal processing industry. This will be true until some new source of benzene is developed.

Major uses of benzene during 1948 are estimated by the industry approximately as follows: For styrene, 50 million gallons; for synthetic phenol, 40; for nylon, 20; for aniline, 15; for solvents and special chemicals, 15; and for diphenyl, synthetic detergents, dichlorobenzene, monochlorobenzene, nitrobenzene (not for aniline), and for other specialties, from 4 to 8 million gallons each. The industry estimates that approximately 160 million gallons was used in 1948 for these and related chemical purposes.

Benzene demand will certainly be at least 180 million gallons for 1949. And no one knows how high the consumption would go if manufacturers of styrene for rubber, phenol for plastics, and other big markets were assured that they could have all of the benzene as raw materials which they care to buy at a reasonable figure, even at a figure not much less than the shortage price of 1948.

Continued growth of synthetic rubber, plastics, nylon, and other specialty demands seems to place benzene in the shortage class for some years to come. Certainly it will be a long time before motor-grade benzene will again return in quantity seeking an outlet at the 10 to 15-c. price range which was so common only a few years before the war. And the aviation-fuel maker certainly will come in to take any such surplus of motor benzene long before the automobile fuel blender gets a chance to buy any great quantity at a low price.

Coal-tar production from coke ovens should have supplied the tar refiner with record quantities of raw material during the past year, because production was of record magnitude. However, the crude tar actually sold for refining and other non-fuel purposes was about 15 percent less than the preceding year. This was not caused by a lack of desire to buy on the part of tar refiners. It came about primarily because of a reluctance of oven operators to sell.

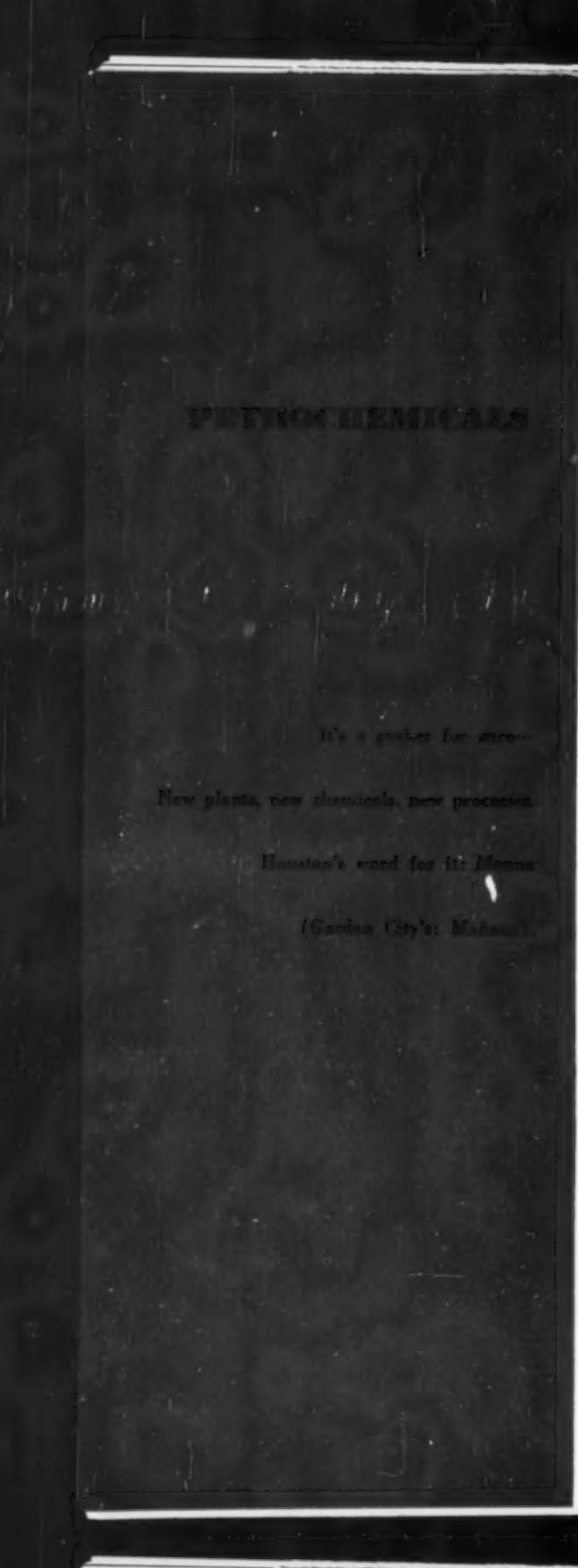
As the price of heavy fuel oil has advanced during recent years, and the supply has become increasingly uncertain, oven operators have been reluctant to sell their tar and be dependent on purchased fuel oil for open-hearth and other furnace use in affiliated metallurgical works. Even the normal differential in price per gallon has no longer attracted tar into the refiners control. And there is no evidence that this will be less true in the near future. Consequently a smaller percentage of total tar production is likely to be refined than one would expect in view of the continuing large demand for tar derivatives.

Main reason that so much tar is still going to the refinery is that users of creosote, tar acids, and phenolic derivatives for the plastics industry can pay a premium price for these important derivatives of tar distillation. If the imports of creosote and other tar chemicals should develop as recent trends imply, then the price may continue to sag, and domestic production will correspondingly shrink. Certainly tar refiners can not pay from 12 to 15 c. per gal. for tar in order to take it away from fuel use in affiliated metallurgical works, unless they can get very high prices for these derivatives. And already there is some evidence that they can not expect such high prices for phenolics, tar acids, or creosote. Imports from Britain, made to secure American dollars are likely to take care of the supply deficit. Certainly we will not see a return to the conditions commonly met in prewar years when tar could be bought at a price per gallon about 40 percent of the prevailing market price for creosote per pound.

Another factor which seems to indicate that these tar derivatives may not continue to reach one of their major markets in a dominant way as heretofore is the increased use of synthetic chemicals instead of creosote for wood treatment. In a number of cases these chemicals for wood preservation have found substantial advantage, sometimes for rather unusual reasons. Not only can wood be made more attractive by painting over chemical treatment, but also the public relations aspect may be significant. For example, a public utility is quite reluctant to use poles or posts which may cause staining of clothing which comes in contact with creosote-treated poles along the highway, particularly in urban areas. And even the creosoted appearance is at times of sufficient disadvantage to warrant considering chemical treatment if the end result is equal durability and better appearance without too great an increase in cost.

As a result of these and other factors, the demand for the creosote family and its related chemicals seems likely to be met in substantial measure indirectly, and thus the scarcity factor be minimized despite the tendency to burn more tar rather than to refine it.

Another factor that looms more important in the distance, is the development of coal products by hydrogenation. A ton of coal treated in an ordinary oven produces about 2 lb. of tar acids. If the same coal be hydrogenated, the expected yield is 9 lb. of tar acids. And if some of the extraction-hydrogenation methods develop as expected, there might be from 15 to 18 lb. made per ton of coal. When and if such specialized processing of coal for synthetic liquid fuels does become a commercial reality, then we may expect a new source of tar acids as well as new production of many other chemicals some of which are now scarce. That expectation is not likely to be realized for at least five or ten years.



■ LAST YEAR the Southwest again led in completed new construction in the petrochemicals field. This was to be expected, in view of the heavy expansion programs initiated there after the war. In 1949 it is probable that the Southwest will again lead in commercial developments. The surmise is based on announced new construction for the year and the great resources of natural gas and gases from petroleum refineries in the region.

Aside from regional factors we may expect continued growth, nationally, in the manufacture of existing commercial chemicals from petroleum and related gases, and the development of new products arising from research now under way or planned for the future.

Speaking of 1948 in general terms, products designed for or capable of being used in the manufacture of plastics featured the new construction. Along with these were alcohols, aliphatic hydrocarbons and aromatics. Aromatics, particularly toluene and benzene, were in great demand for aviation gasoline, and they will probably continue in demand for that purpose this year.

This year there is emphasis on the construction of new capacity for producing synthetic ammonia. This reflects the heavy requirements for ammonia as a source of nitrogenous fertilizers in the United States and occupied countries. Most construction projects this year are for ammonia and its salts.

With respect to noteworthy construction in 1948, the completion of a number of units in the burgeoning plant of Shell Chemical Corp. at Houston merits attention. The world's first synthetic glycerine unit, of course, heads the list. Other Shell units placed on stream included facilities for the production of ethyl alcohol, ethyl chloride, hexylene glycol, secondary butyl alcohol and methyl ethyl ketone. With that array of completions Shell Chemical substantially finished its postwar program at Houston, but there is no reason to believe that further expansions will not occur.

At Houston, Rohm & Haas began the manufacture of acetone cynanhydrin and ethylene cyanhydrin for shipment to other points for the production of acrylics. The Rohm & Haas plant is the first of its kind on the Gulf Coast.

Esso Standard Oil Co. at Baton Rouge announced late in the year the first commercial production in this country of iso-octyl alcohol by the catalytic synthesis of an olefin, hydrogen and carbon monoxide as based on the Oxo process developed in Germany. Esso contemplates installment of additional capacity to make the product, which is of interest as a plasticizer, anti-foaming agent, wetting agent, etc.

During 1948 two new companies entered the petrochemicals field. One, McCarthy Chemical Co., opened its new plant at Winnie, Tex. to manufacture formaldehyde, acetaldehyde and methanol from natural gas and its components. The other, Stanton Chemicals, Inc., began manufacturing aromatic chemicals at Corpus Christi, Tex., using petroleum fractions as raw materials.

At El Dorado, Ark., Lion Oil Co. established a petrochemicals research laboratory and began expanding facilities for its production of anhydrous ammonia, with completion scheduled for this spring. Lion has gone extensively into chemicals production for several years, using its petroleum refinery as the point of departure.

In a negative sense, one of the biggest commercial developments last year was the abandonment by Stanolind Oil & Gas Co. of its projected synthesis plant at Garden City, Kan., to produce gasoline and chemicals by a modified Fischer-Tropsch process. Stanolind officials said the excessive increase in estimated investment costs was the reason, but did not close the door to a later resumption of

the undertaking. There has been some speculation as to additional reasons for the move, such as the possibility that the company may see prospects for material processing improvements that warrant delay in building the plant as originally planned.

As to research and development work last year, this continued at an energetic pace. Socony Vacuum Oil Co. announced the availability, for licensing, of a new process for the manufacture of ethylene, an olefin of rapidly growing importance, by the thermal cracking of ethane and heavier hydrocarbons or hydrocarbon mixtures. Socony's process, called Thermofor Pyrolytic Cracking, involves the contacting of the hydrocarbons by a moving bed of refractory pebbles heated periodically to high temperatures. High heat transfer rates and high yields of ethylene are announced as features.

Further advances were made in synthetic materials for textiles. One of the leading announcements in this category came from Du Pont, which announced in December the new fiber Orlon, an acrylic product being made in limited amounts in a pilot plant at Waynesboro, Va. The company regards Orlon as having great commercial prospects, and plans to build a commercial unit in Camden, S. C., to manufacture it.

New investments for research facilities were made, despite excessive construction costs, a fact that indicates the importance of intensified research to produce new petrochemicals and to reduce the costs of those now being manufactured. A sampling of the larger companies included Stanolind Oil & Gas Co., a centralized research center at Tulsa, Okla.; Humble Oil & Refining Co., centralized research center at Baytown, Tex.; Pan American Refining Corp., enlargement of laboratories at Texas City, Tex.; the Texas Co., a large expansion of research facilities at Beacon, N. Y.; Standard Oil Co. (Indiana), inauguration of a long-term growth in research at Whiting, Ind.; Standard Oil Development Co., opened new research center at Linden, N. J.

To take a look at 1949 prospects in petrochemicals, here is what is shaping up for new commercial construction. As mentioned above, most activity will center in the Southwest. Projects for synthetic ammonia and ammonia salts dominate.

Phillips Petroleum Co., through its new subsidiary, Phillips Chemical Co., will complete an ammonium sulphate plant at Houston. Phillips will ship anhydrous ammonia to Houston from the Cactus Ordnance Works, Etter, Tex., which Phillips is expanding to increase the output of ammonia and to install equipment to manufacture ammonium nitrate.

Hercules Powder Co. plans to operate anhydrous ammonia facilities being moved from Missouri Ordnance Works, Louisiana, Mo., to Houston. The equipment will be located at the San Jacinto Ordnance Depot, Houston, and operated for the government's account for export to occupied countries.

Lion Oil Co. expects to put into operation late this year an ammonium sulphate plant at El Dorado, Ark., to make 380 tons per day of that product.

Another company about to enter the manufacture of anhydrous ammonia for fertilizers is the Mississippi Chemical Corp., a farm cooperative venture organized in Mississippi last fall. Mississippi Chemical plans to build a unit to produce 150 tons per day of ammonia, and may produce ammonium nitrate also.

Late last year another project that may involve the construction of an anhydrous ammonia plant was under way in Arkansas. Organizers backed by the Arkansas Farm Bureau Cooperative and the Arkansas Farm Bureau Federation began a drive to get planters in the state to contribute to stock purchases in the enterprise. Stock sales were scheduled to begin last month.

Outside the ammonia picture for 1949, Reichhold Chemicals, Inc., is looking at Houston as a site for a plant to manufacture alkyd and perhaps other resins. A Reichhold official was in Houston several months ago and said the company was strongly interested in Houston as a new locality for operations.

This year Du Pont will probably begin construction of one of the largest ventures of 1949. The company has acquired 1,700 acres for a new plant near Victoria, Tex., to manufacture intermediates for shipment to other Du Pont plants for the production of nylon products. One estimate is that the investment at Victoria, in the lower Texas Gulf Coast area, will be in the vicinity of $8 million.

Celanese Corp. of America has enlarged its land holdings around its Chemical plant at Bishop, Tex., by approximately 1,000 acres in recent months. The company has announced no plans for use of the new property, but the expansion suggests that Celanese may launch a new construction program there. Propane and butane are the basic hydrocarbons being processed as raw materials at Bishop.

An interesting development last year was Diamond Alkali's announcement of pilot plant work to be undertaken on chlorinated ethylene products as its new caustic-chlorine plant near Houston. Company officials have indicated that a commercial unit to manufacture such products may be erected there in the near future. The Houston plant of Shell Chemical Corp., which is furnishing the ethylene for experimental purposes, would be the most convenient source for the large-scale supply of that material.

On the Pacific Coast, Union Oil Co. of California plans to install a Hypersorption unit, which the company developed, for use in connection with production and recovery of ethylene from gases in the company's refinery at Wilmington. It is understood that Union will use the ethylene to manufacture ethanol and its derivatives.

Research and development this year will continue at a high level, as indicated by expansions by many companies of their laboratory facilities. Considerable attention will be given to further refinements of the Oxo process as a source of alcohols, aldehydes and acids by the catalytic combination of olefins, carbon monoxide and hydrogen. As mentioned before, Esso Standard Oil Co. has announced the first commercial production of iso-octyl alcohol based on this process. The Esso Laboratories are interested in the development of other higher alcohols. Several oil companies are working in the same field but have not announced their activities yet.

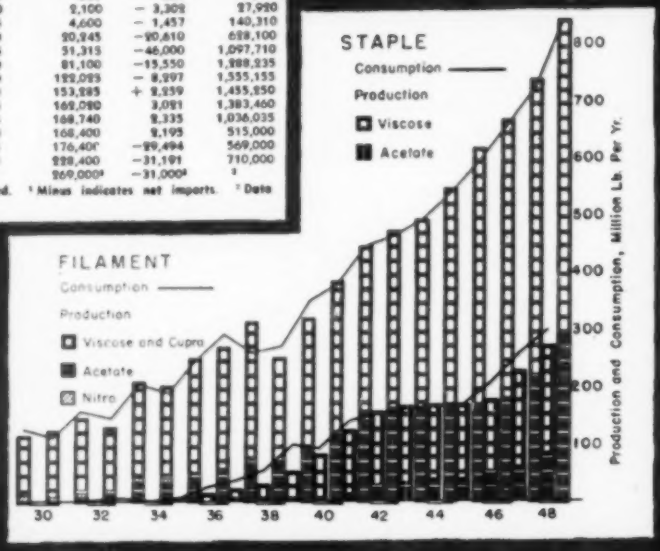
Further investigations directed toward more economical methods of producing ethylene and conversion of the product into chemicals are under way. Socony-Vacuum's development of its Thermofor Pyrolytic process for ethylene production is indicative of interest in this field. At the Fourth Annual Southwest Regional Meeting of the American Chemical Society, Shreveport, Bruce K. Brown said that ethylene, a source of ethanol, ethylene glycol, plastics and other materials, is perhaps the most important single raw material in the synthetic organic chemical industry.

Efforts will continue in the improvement of processing details for the conversion of natural gas, via Fischer-Tropsch modifications, into gasoline and byproduct chemicals. Technologists consider there are numerous problems in the field that have not been solved satisfactorily. It is believed that marked improvements are likely to be made in higher space velocities, better thermal efficiencies and lower investment costs resulting from these and other advances. Also, there is opinion that better methods of separating the byproduct chemicals are likely to be developed.

U. S. and World Production of Rayon, Thousand [1]

Year	Filament Yarns: U. S. Production	U. S. Export Balance[2]	World Production	Staple Fiber: U. S. Production	U. S. Export Balance[2]	World Production
1923	34,960	−3,029	107,900	.....	.....	.....
1925	51,050	−5,293	185,990	.....	.....	.....
1927	75,555	−14,633	295,095	.....	.....	.....
1929	121,400	−14,832	434,215	500	− 1,052	7,165
1931	150,880	− 1,490	500,195	880	− 663	7,980
1933	213,500	+ 176	665,000	2,100	− 3,302	27,920
1935	257,555	2,161	940,855	4,600	− 1,457	140,310
1937	320,995	410	1,203,890	20,245	−20,610	628,100
1939	328,685	1,518	1,156,115	31,315	−46,000	1,097,710
1940	390,070	1,329	1,181,180	81,100	−15,550	1,288,235
1941	451,905	3,213	1,270,240	122,023	− 8,297	1,555,155
1942	479,330	5,488	1,196,170	153,285	+ 2,259	1,455,250
1943	501,125	9,249	1,149,655	162,080	3,091	1,383,460
1944	555,215	16,767	1,030,655	168,740	2,335	1,036,035
1945	623,670	20,573	901,060	168,400	2,195	515,000
1946	677,540	15,155	1,102,655	176,40[illegible]	−29,494	569,000
1947	746,700	23,483	1,290,000	228,400	−31,191	710,000
1948	851,000[3]	6,000[3]	?	269,000[3]	−31,000[3]	?

Data from *Rayon Organon* except as indicated. ? Data unavailable. [2] Minus indicates net imports. [3] *Chemical Engineering* estimate.



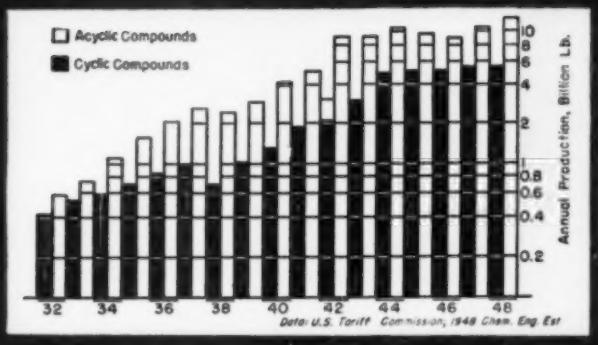
■ RAYON production and consumption exceeded a billion pounds in the United States for the first time in 1948. We estimate production of the usual rayons to have totalled 1,120,000,000 lb., with another 70,000,000 lb. for the true synthetic fibers such as nylon, Vinyon and Saran. In 1947 the rayons totalled 975,000,000 lb. with perhaps 50,000,000 for the synthetics. In spite of this enormous production level, demand exceeded supply and it is believed that final figures will show a net import of about 25,000,000 lb. and a total consumption of 1,215,000,000 lb. of rayons, plus the synthetics.

Based on data from various sources, particularly the 11 months figures of *Rayon Organon*, these estimates will require some later revision, although not much. Production, up about 16 percent over 1947, included an estimated 561,000,000 lb. of viscose and cupra filament yarns, 290,000,000 lb. of acetate filament yarns, 184,000,000 lb. of viscose staple, and 85,000,000 lb. of acetate staple. With almost 250,000,000 lb. of the viscose total as tire yarns, it is interesting to note that viscose textile yarns have almost been overtaken in volume by the acetate.

Can such levels be maintained? Evidently the industry thinks they can, since construction is continuing on several new plants and *Rayon Organon* projects a capacity increase of 7.3 percent beyond the November 1948 level by mid-1949, and 8 percent beyond for early 1950. This estimate anticipates a total capacity of 1,254,000,000 lb. of rayons for the latter date, with 49.3 percent viscose filaments, 27.8 percent acetate filaments, 14.5 percent viscose staple and 8.4 percent acetate staple.

Against this optimistic estimate of the future is the fact that a buyer's market developed in rayon goods at the retail level during the latter part of 1948 and may eventually filter down to the level of the primary producers if it should be sustained. Still, we feel that a 5 percent increase in 1949 is not at all improbable, while a 6 or 7 percent rise is not impossible.

Technically, 1948 offered few surprises. Nylon staple began to cut a figure and Dupont's Fiber A was christened Orlon. It will be made in a new plant at Camden, S. C. Imperial Chemical Industries announced Terylene, which may have later implications for the United States. Virginia-Carolina Chemical Co., taking over the Aralac plant at Taftville, Conn., announced a program of commercial development for a protein fiber to be made there, possibly from peanuts (as is I.C.I.'s Ardil). Two new continuous spinning processes were announced, one already in use by American Bemberg, and the other to be installed within the next year and one-half by American Viscose. Two new producers entered the business during the year and five new plants or major expansions were under way at the year end. Among the most important developments of the year were the decisions to erect three new dissolving pulp mills, two by rayon manufacturers, and one by a large pulp and paper producer. By late 1950 these additions will have increased present U. S. plus Canadian dissolving pulp capacity by about 35 percent and will have relieved a tight situation that has existed for several years.



SYNTHETIC ORGANICS

■ Organic chemical salesmen with order books in hand are knocking on the doors of prospective customers again. They no longer have to explain delays in delivery. The reason: Organic chemicals producers have completed a large part of their postwar expansion and have finally been able to catch up with a demand that, at times, seemed infinite. First to reach such a balance were the formaldehyde producers. Early in the year they had suffered from a lack of methanol. Then, during the summer, expanded capacities of this chemical gave them an opportunity to push production. The rapid increase in output swamped consumers—the buyer's market was back.

For most other organics, the return to a buyer's market (or more properly, a return to a balance between supply and demand) came about more gradually. This balance was achieved by expanding production to meet consuming requirements. It was not due to a sharp break in demand. Synthetic organic plant expansion was carried out by all major producers this year.

Du Pont expanded its methanol output, almost doubled its urea capacities, and diversified its Niagara Falls production. It expanded its research center at Wilmington, and is expanding its nylon salt works by building a new plant in Texas. Carbide and Carbon continues its $104 million expansion program and very sizable additions to its Texas City plant were made, along with new units completed at South Charleston and Whiting. Solvay Process Division, Allied Chemical and Dye Corp. will bring in a new 170 ton-per-day urea plant at South Point, Ohio, this year.

These are only a few of the projects which brought the production of synthetic organic chemicals up from 16 billion pounds in 1947 to 18 billion pounds last year and which will probably push the total to 19 billion pounds in 1949. Reason for optimism in the organic outlook is found in the dynamic nature of the industry. New products and processes continue to inject vigor into the markets each year.

Synthetic detergents came of age in 1948. Many firms were active and growing in this field. Among them were Allied Chemical and Dye Corp., Du Pont, Monsanto, Oronite Chemical, Rohm and Haas, as well as some petroleum and soap companies. During the year there was widespread acceptance of non-ionic and non-foaming types of detergents such as Monsanto's Sterox and General Aniline's Glim. They are now being distributed particularly for use in automatic washers. Synthetic organic phosphates such as Procter and Gamble's Tide have proved successful in hard water areas.

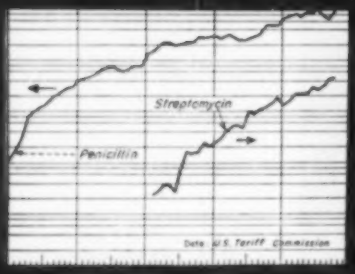
Synthetic glycerine joined the fast growing list of commercially available synthetics as Shell Chemical got their Houston unit into operation this year. (see Petrochemicals, pp. 120, 121.)

Oxo-synthesis operations are being expanded by Esso Standard and with Standard of Indiana's nonyl alcohol operations larger commercial quantities of higher alcohols will be arriving this year. With other higher alcohols like 2-ethylhexanol and isooctyl alcohol beginning to catch up with demand the plasticizer supply picture has eased considerably. Dioctyl phthalate production was started late last year by Cyanamid. Carbide and Ohio Apex are already producing tankcar quantities of this polyvinyl chloride plasticizer. Increased production has solved the shortage problem. In addition to the phthalates and phosphates there has been increasing use of other esters such as adipates, sebacates, and azelates, maleates and fumarates.

Fluoro-organic chemicals are becoming more important commercially and may have more far reaching applications than may be readily apparent. Kel-F (see Plastics, p. 125), a polytrifluoromonochloroethylene used in plastics is an example.

Cold rubber arrived in 1948. It was the synthetic answer to natural rubber. This means that natural rubber is going to get stiff competition in tire tread markets in the next few years. The Co-Polymer Corp. built the first plant for the new material, but Phillips and rubber companies as well as University of Minnesota and Hercules were among the others that had a part in this development.

New insecticides and weed killers became commercially available in 1948. They will compliment some existing chemicals and compete with others. Parathion is a new insecticide which came into production last year. American Cyanamid and Monsanto are making it, and they expect it to round out a full contingent of insecticides which can control insect pests. A new weed killer, 2,4,5-trichlorophenoxyacetic acid (which will complement 2,4-D on woody plants) was added to the agricultural chemicals last year.



■ WILL pharmaceuticals enter a buyer's market in 1949? They will if a buyer's market means a normal, highly competitive market with adequate raw materials, intensified sales effort and selective price trimming. While total volume may be down 10 percent from 1948, production and consumption of pharmaceuticals in 1949 will continue at a high level, with prices firm. Antibiotics are still the big dollar earners. And initial demand for new drugs created by research always outstrips production.

Drug store sales of all merchandise in the first half of 1949 should be about $1,724,000,000, down 3 percent from first-half 1948. Retail value of drugs consumed each year in the U. S. amounts to $1 billion, or $7 a person.

To keep their customers, manufacturers have cut streptomycin and dihydrostreptomycin prices 20 percent, even though these drugs are short. Penicillin is in a highly competitive situation. Who in 1942 would have dreamed of penicillin at less than 20c. per 100,000 units? Nevertheless, penicillin and streptomycin accounted for over half the dollar value of 1948 synthetic drug output. Despite the February price boosts and Calco's production at 80 percent of wartime peak, the sulfa drugs are in a stable market. Over-the-counter vitamin sales are off. Cosmetics and toiletries have been hit by the 20 percent federal tax.

Exports of U. S. pharmaceuticals will drop perhaps 15 to 20 percent in 1949. In 1948 they neared $200 million, with Latin America getting half. By doubling our 1947 exports of antibiotics last year to $70 million, we offset declines of almost 25 percent in other drugs. But our overseas production, which now about equals our $200 million exports, took up the slack. (Squibb expects to bring in its Buenos Aires plant this year.) Nevertheless, U. S. drug makers are beginning to feel the pinch of the foreign dollar famine. Too, Europe's drug industry is getting back on its feet.

Most exports to Europe have been antibiotics. Penicillin and streptomycin made up half of ECA shipments, in all not large. Merck, with ECA backing, is designing and equipping a penicillin plant for West Germany. Production prospects in Western Europe and overseas investment are the keys to potential markets in Eastern Europe, Africa and Asia.

Lederle plans commercial production of aureomycin at Pearl River, N. Y., within six months. Chloromycetin, pioneered by Parke Davis, combats typhus. Commercial Solvents and Upjohn have developed bacitricin to treat skin and surgical infections. Dihydrostreptomycin, with less immediate neurotoxicity than streptomycin, advances tuberculosis therapy. Even newer in the tuberculosis battle is research on *p*-amino salicylic acid. Procaine penicillin, which stays in the blood longer, and other dosage forms have refined administration of penicillin. Pfizer has been active in developing procaine penicillin.

Merck hopes to achieve commercial production of B_{12}, the anti-pernicious anemia vitamin, from a mold in 1949. B_{12} may be identical with APF, the animal protein factor, that Lederle has been working with. For B_{12}, Merck has the animal feed idea. Distillation Products is producing synthetic vitamin A, competitor of fish liver oils.

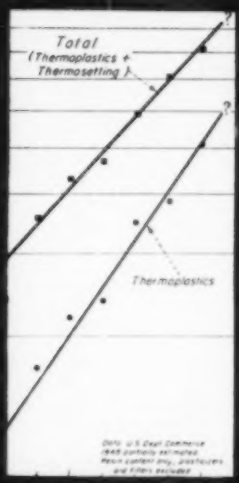
In antihistaminics, the hay fever and allergy drugs, Lederle, Lilly and Hoffmann La Roche have come hard on the heels of Parke Davis and Ciba. New antihistaminics: Trimeton, Merrill's Decapryn and Lederle's Tagathen. New local anesthetics have been developed by Lilly and Winthrop. And Lederle has introduced Darvisul, or phenosulfazole, potential weapon against polio.

Chromatography is used by Merck to purify streptomycin and by Valley Vitamins to separate carotene, xanthophyll and chlorophyll from alfalfa extract. Radioisotopes are potent tools in biochemical research and therapy.

Prominent Synthetic Medicinals, 1947

	Production 1,000 lb.[1]	Sales $1,000
Acetophenetidin (phenacetin)	2,283.2	8,079.1
Acetylsalicylic acid (aspirin)	12,220.1	4,639.3
Salicylic acid	6,274.1	1,239.4
Sulfa drugs	6,148.1	18,546.5
Penicillin	42,087.8[1]	87,109.0
Streptomycin	22.6	24,848.8
Vitamins	2,507.9	35,093.8
Amino acids	439.4	1,803.0
Barbituric acid derivatives	900.1	3,560.3
Theophylline, base and derivatives	358.3	3,075.0
Bile acids and salts	231.5	1,435.9
Theobromine derivatives	139.7	563.8
Niacin diethylamide	57.2	295.4
Calcium levulinate	33.7	39.9
Chlorobutanol	17.3	45.2
Iodoform	17.0	48.5

Data: U. S. Tariff Commission. [1] Penicillin reported in billions of Oxford units.



■ TOTAL production of plastics set a new record in 1948, and 1949 will probably show another increase. But the rate of growth in 1949 will be a lot lower than in 1948. The reason is simple—a buyer's market has arrived.

Only one major plastic today still enjoys a seller's market. That one is polyethylene. The acrylics and cellulosics caught up with demand before 1948. By the end of 1948 all the other major plastic groupings except polyethylene had gone into a buyer's market. The major reason for this move into a buyer's market was natural: new plants increased output to the point where capacity was well above demand, even though the overall demand still grew. Other plastics fell into a buyer's market because some of the newer and cheaper plastics took away their markets.

First to move into a buyer's market were the phenolics. Early in the year it looked like a temporary slump in business, but the drop persisted. By the end of the year it was so serious that phenolic prices began to come down, perhaps foreshadowing price drops in other thermosetting lines. Melamine and urea, aided by increased raw material availability, seemed to be moving into a buyer's market too.

Next on the list was polystyrene. New plants were primarily responsible. Consumption at the beginning of the year was running 10 million pounds per month. By year end the consumption figure was more than 50 percent greater, but capacity had almost doubled. Monsanto's rebuilt plant at Texas City, Bakelite's expansion, Koppers' entry into the field, other expansions all had their effect.

Last on the list to hit a buyer's market were the vinyls. Here, too, new polymer plants came in during 1948. More important, the plasticizer shortage came to an end. Among other new plants, Carbide and Carbon came in at Texas City and Martin's new vinyl plant started at Painesville, although it was not in full operation at the end of the year. With the shortage of plasticizers, that is good plasticizers, it still looked like a seller's market. New plants like Carbide's dioctyl phthalate unit at Institute have overcome that hurdle, and the buyer's market is a fact.

Polyethylene. This is really the hot plastic today, definitely still in a seller's market and destined to stay there for a long time. Last year's production of between 15 and 20 million pounds is probably only one-third the actual demand, at current prices. Du Pont's new polyethylene plant at Orange, Tex., started operation late in November and was just building up to capacity output at the end of the year. The new Carbide plant is due to start operation in March or April. With these new plants, capacity will be up to 50-55 million pounds. That sounds like a big increase, but the producers are confident that even those rates will not meet the demand.

Another plastic still in a seller's market is Teflon, but its production is too small to make it a major plastic. Installation of a large scale plant has been rumored for some time and may begin in 1949.

New Plastics. Among the plastics introduced during the year, the one that made the biggest splash was polymonochlorotrifluoroethylene. Analagous to Du Pont's Teflon, it differs only by having one chlorine on every unit of the polymer chain, replacing a fourth fluorine atom. The plastic retains, at least relatively, many of Teflon's properties. It is high melting, inert to most corrosive materials. Unlike Teflon, it is readily molded or extruded. The only company on the market with the plastic so far is M. W. Kellogg, which calls its product Kel-F. Other companies are actively working on the material. Most of them do not feel they can enter the market until they have developed the process much further and get costs down to a "reasonable" figure. The present process requires terrifically long polymerization times.

Nylon as a plastic got a boost this year when Du Pont's new plant at Parkersburg, W. Va., went into production. Previously, the plastic was only available from a pilot plant. But nylon has been in a buyer's market ever since the new plant opened, even though consumption is slowly growing.

Another new plastic introduced during the year was Plaskon's alkyd molding compound. A thermosetting resin, it can be molded in extremely fast cycles and at lower pressures than usual.

Other new products were primarily modifications, designed to give better high temperature or molding properties.

Low pressure laminating resins continued to be in the doldrums, and the acrylics production continued at well beneath capacity. Cellulose nitrate continued to decline with Celanese dropping out of the market. Ethyl cellulose, too, showed no appreciable gains during the year.

All in all, 1948 was the beginning of the postwar shakedown for the plastics industry. With essentially the whole industry in a buyer's market, 1949 should show more shaking down with the emphasis on quality. Even so, 1949 should show another record for total production poundage.

■ Big news in the solvent picture in the past few months was the nosedive taken by ethyl alcohol prices (chart). This was caused by several factors. Shell Chemical began producing synthetic ethyl alcohol directly from ethylene, Publicker Industries got a lot of cheap molasses from Cuba, and some fermenters got cheap surplus potatoes. But the biggest factor was the arrival of the postwar adjustment period for the alcohol and solvent business. This had been generally predicted immediately after V-J Day, and it became a reality in 1948. While demand for the year was good, underlying developments have occurred which indicate that supply and demand are in balance and industry has returned to a normal condition.

Ethyl Alcohol. During the first quarter of 1948 the alcohol market was unsettled as alcohol producers and Cuban authorities were deadlocked in their negotiations for the incoming molasses crop. The crop was estimated at 300 million gallons, of which the Cubans sold the British Government about 90 million gallons at 18c., with a tie-in sale of 5 million gallons of ethyl alcohol at 70c. A large cattle food supplier purchased 40 million gallons, and the balance of the crop was held in Cuba.

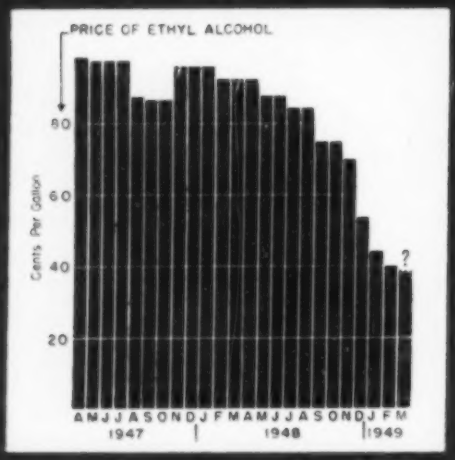
Negotiations which started in the first quarter were not fully consummated by the end of the year. Fermenters were hesitant about making commitments on molasses as they knew a new synthetic alcohol plant was expected. During the last part of 1947 one of the large alcohol companies, (U. S. Industrial Chemicals, Inc.), announced that they had become the distributor of a considerable amount of ethyl alcohol to be supplied by a Fischer-Tropsch plant.

As a result of these threats, fermenters managed to cover their immediate requirements and as the British Government did not have adequate storage to take in their commitment, considerable molasses remained in Cuba. As it moved out slowly, the price of molasses weakened and during the second half of the year the price declined approximately 0.5c. per gal. per month.

Another unsettling factor was the action of the United States Government in regard to a large surplus of potatoes which they purchased at support levels at $1.50 per bu. As it was an election year, efforts were made to minimize the farm surplus, and large quantities of potatoes were sold to fermenters as low as 5c. per bu., in addition to which the government paid freight to the plants which is estimated to be 25c. per bu. These low priced potatoes enabled producers who were equipped to handle them, to sell alcohol below the price at which alcohol produced from molasses was selling. This condition further unsettled the market, and one producer made a general practice of selling 3-4c. per gal. below competition. These tactics irritated the other large producers, and while the general price structure retreated in an orderly manner, the large buyers were still purchasing during the whole year at under the quoted schedules.

During the third quarter of the year a new synthetic alcohol producer, Shell, indicated that they would not be in production until late in the year and it was announced that construction of a large Fischer-Tropsch plant had been indefinitely postponed. For a short while it appeared that the market would stabilize. However, just as Shell commenced deliveries, one of the large fermenters, Publicker, announced that they had closed a deal for the entire surplus of Cuban molasses, estimated at 80 million gallons, on a sliding scale based on the quoted price of pure alcohol. Almost immediately the price of alcohol began to decline and within a month the quoted prices dropped 30c. per gal.

At the end of the year the markets were weak; as Publicker, who purchased the molasses, is still required to buy 60 million gallons of the crop, before the new crop is ready.



	Total					
	Million Proof Gal.					
	1941	1943	1945	1946	1947	1948
Production*	290	448	683	329	249	332
Withdrawn for denaturing†	274	408	971	393	338	340
Withdrawn tax-paid	28	6	28	47	47	39
Stocks, June 30	10	210	141	111	27	38

	Denatured		
	Wine Gal.		
Production*	1948	1947	1946
Completely denatured	34,887,789	36,395,715	26,144,437
Specially denatured	150,359,378	147,348,371	186,657,673
Total	185,108,031	183,744,086	212,802,110
Withdrawals†			
Completely denatured	34,748,659	36,284,125	27,118,835
Specially denatured	150,359,372	154,987,752	197,554,311
Total	185,108,031	191,251,877	224,673,146
Losses	109,257	147,446	285,815
Stocks, June			
Completely denatured	226,077	102,261	43,595
Specially denatured	846,588	1,878,777	8,919,656
Total	1,072,659	1,981,038	8,965,251

*Production at industrial alcohol plants. †Represents products withdrawn as alcohol, spirits, or unfinished spirits. (Data for fiscal years ending June 30.)

unless it invokes an escape clause which gives it the right to cancel the deal if the price of alcohol falls below 41c.

It is expected that during the coming year the alcohol price will be between 30-40c. per gal. and that all producers will have a selling problem throughout the year.

Methanol. It was predicted that by the early part of 1948 methanol facilities, under construction, would have been completed in time to contribute to the stabilization of the unbalanced price condition which existed at the time in the alcohol and solvents market. However, as a result of strikes and delays, construction of these facilities was slowed up so that the anticipated effect did not materialize and a considerable amount of relatively high priced ethyl alcohol was sold for anti-freeze, whereas it was anticipated that the whole market for the volatile type of anti-freeze would be supplied with methyl or methyl-isopropyl blends.

Also, the demand for ammonia, both for fertilizer and chemicals, continued to be strong so that for the first ten months of 1948 the methanol supply was restricted.

One of the newer producers, however, has now announced that they are opening another train which would indicate overproduction for the year 1949. On the other hand, the major producer is curtailing his methanol production. The net result to be expected is that methanol will be in fair supply at least during the second half of 1949.

One of the factors that contributed to the tight supply of methanol in 1948, was the fact that most of the producers diverted their product into the production of formaldehyde, as the return per gallon was higher on formaldehyde than it was on alcohol itself. The drop-off in the resin business, however, curtailed the demand for formaldehyde, so at the end of the year the market was very weak. Production of wood distillation methanol continued to decline and one of the recently organized companies has been involved in financial and political difficulties which resulted in curtailed production, so the supply and demand are just about equal.

Isopropyl Alcohol. The shortage of methyl alcohol, and the high price of fermentation ethyl, further increased consumption of isopropyl alcohol in the industrial field. Estimated production of 115 million gallons was about 7 per cent higher than the previous year's production. Consumption of isopropyl alcohol continued high, so the supply was short the whole year.

Acetone. During 1948 the acetone market was firm. Production was close to 450 million pounds. As was the case in 1947, production of acetone was curtailed due to labor troubles experienced by the two major producers, so that at no time during the year was the supply of acetone in excess of demand.

The export demand, however, fell off and as synthetic plants are being constructed in Europe, it is expected that this export demand will be lost permanently after 1951.

Higher Alcohol and Acetates. As was the case of ethyl alcohol, normal butyl alcohol from fermentation was placed in a more favorable position because of the potato surplus and declining molasses market; so for the first time in many years fermenters were put in a position to compete with the synthetic producer. This extra production, plus a spotty demand throughout the year resulted in a softening of the markets and prices declined from 33 to 18c. per lb.

The market for ethyl acetate and isopropyl acetate has declined to a degree that producers no longer feel that raw material reductions have to be reflected immediately in the acetate price. As the prices of secondary butyl acetate and alcohol were well below the price of normal butyl, both were in demand during the year and production was not sufficient to take care of the demand.

The market for methyl isobutyl ketone was reported firm and as a result a lower price has made considerable inroads into the butyl acetate market.

The synthetic amyl producer who has diverted his production to the pharmaceutical field for the past few years has increased facilities and is endeavoring to gain his former position in the solvent field. However, higher prices and the adoption of competing materials are making the comeback rather difficult.

Methyl Ethyl Ketone. The year 1948 was another year during which methyl ethyl ketone producers operated to capacity and ended the year without inventory. Apparent leveling off in the use of vinyl resin coatings and the delay in construction of dewaxing plants has taken the pressure off the demand for increasing amounts of ketone.

As both producers have increased their production, it is expected that during the coming year efforts will be made to replace more ethyl acetate.

Conclusions. Ever since 1939, even under more unfavorable conditions, the alcohol and solvent business has been without major selling difficulties or price declines and most of the period has been spent allocating production. Increased facilities and a stabilization of the demand has tended to foster overproduction of most of these materials so that unless preparations for war increase the demand for these products, the year 1949 would be the first in a decade that the industry would be beset with sales difficulties.

Synthetic ethanol production probably will be about the same as it was in 1948, or approximately 165 million gallons, in addition to which there will be at least 110 million gallons of isopropyl alcohol, and probably 140 million gallons of methyl produced, which is considerably higher than corresponding figures in 1939, or in the case of the last two, for any year since.

During the past ten years the greater part of both isopropyl and methyl alcohol productions have been converted to chemicals or exported. Next year if there is any slackening in the demand for these chemicals or decline in export markets, supply of these alcohols will be in excess of the demand.

As the price of both isopropyl and methyl is still substantially lower than the quoted price of ethyl, ethyl alcohol is not yet in a position to regain, on an economical basis, the gallonage that was lost during the past ten years. At the present time, exclusive of chemical uses and anti-freeze, the market for ethyl is not over 50 million gallons, and to increase the demand they must regain the gallonage lost to methyl and isopropyl.

The price of methyl at present is substantially lower than those prices predicted for fermentation ethyl, and as the isopropyl producers are notifying their customers that they intend to hold the gallonage gained during the past ten years, it is evident that the ethyl producers, both from fermentation and synthetic sources, will be faced with selling problems.

During the past decade higher wages, as well as new laws, have contributed to the increase in manufacturing and distributing costs so that even though molasses sells at 1939 levels, the price of alcohol will not show any substantial advantage over the value of isopropyl and methyl alcohols. As it is expected that the agricultural subsidy plan will continue for some time, if the price of molasses is lower than its equivalent value for wheat or corn, much of the black strap molasses will be diverted to cattle food, the quantity of which is estimated at 85 million gallons. With an expected reduction in the sugar crop, beginning in 1949, the quantity of surplus blackstrap molasses will not be too great, so that we may find in 1950, if not in 1949, that the fermentation industry may be eclipsed, at least temporarily.

OUR THANKS – AND YOURS

To the many who have helped the editors in the preparation of this special report go our sincere thanks and, we hope, yours. To name them all here is scarcely possible for each article and commodity review is the result of interviews with many experts and industry authorities. But for exceptional services and cooperation we must cite Dexter M. Keezer, William F. Butler, Sanford S. Parker, Peter French and Robert Ulin of the McGraw-Hill Economics Department, Ferdinand Eberstadt and Francis Williams of Chemical Fund, Inc., and Samuel P. Gibson, president, and James G. Park, past president of the Chemical Market Research Association.

Break-Even Points (*Continued from page 111*)

also, to feel that the price structure on a line of products is being held.

But the sounder decision is to reduce prices: (1) It is sounder company policy. Obviously, it is better public relations; price cuts are always good news. It is better labor relations as well, since heavy layoffs, which will wreck any employee-relations program, are more or less avoided. And if the policy creates more sales, then its distribution aspect is better too. (2) It is sounder general policy, as well. Any policy that adds to job stability is sound today; any policy that doesn't, isn't. (3) Reducing prices is better economics. By keeping production going, the chemical producer continues to put out buying power in the form of wages instead of turning it off when it is most needed. And the seller is aggressively seeking the market, instead of sitting back and waiting for it to come to him. (4) Reducing prices is the method of free chemical enterprise, making more and better products available to more people at lower prices. The long swing of chemical progress has moved on a cycle of ever-lower prices. Balancing supply and demand by reducing production is the "economy of scarcity," and not the chemical way.

But how about costs? And will price cuts work for all producers? These questions suggest two limitations. If raw-materials prices don't drop when sales do, the producer in whose costs they figure heavily is handicapped in cutting prices. Yet, commodity and other raw material prices almost always fall when sales do. So the question is largely academic.

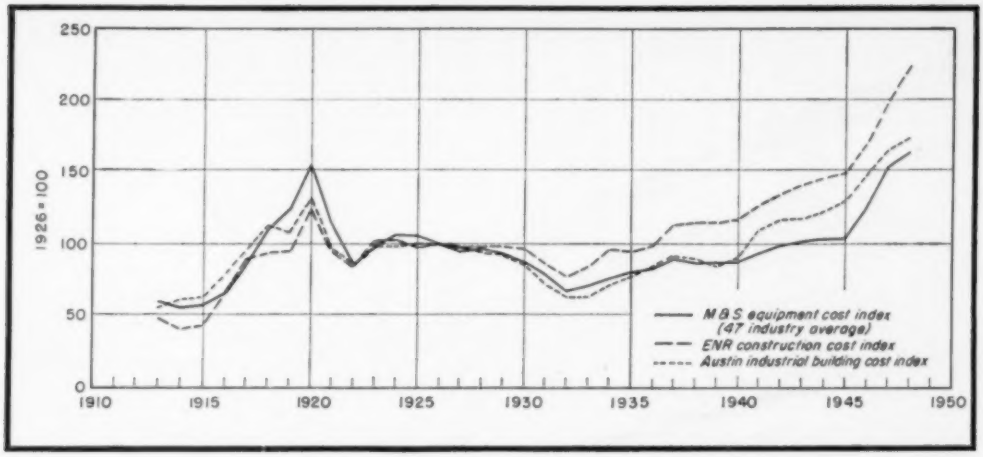
Labor costs are another obstacle to price reduction, a more serious obstacle today than ever before, but the chemical industry has a relatively small problem, as compared with other industry classifications. Improved techniques can raise worker productivity substantially, as the experience of many companies shows. Handled the right way, unions will help management find ways to cut not only labor costs but others.

Will sales always rise when prices are cut? No. Some chemical products show little direct and immediate response. However, in the long run, the relationship appears. More important is the fact that industrial chemicals must be an important instrument of a cut in the costs of manufactured goods. Consequently, a cut in chemical prices also helps lower costs and prices on other products. Much that happened to industry under the New Deal was a direct result of companies choosing to lay off men and maintain prices when a depression hit. It should not happen again tomorrow. When this decision faces the chemical industries, be it in the near or distant future, managers will have an outstanding opportunity to act in the public interest.

While break-even points in the chemical industry have risen, the future seems hardly pessimistic for the industry. Better control during the last year or so, has already given results in some companies. The break-even points are now tending to level off and diminish. It is hard to compare two periods—even though only seven years apart—because of the drastic changes which have occurred in the nation's economy since 1940. When weighed against other prices or against the amount of goods and serviced produced, chemical prices are somewhat low and approximately in line with past experience at times of active demand. In fact, chemical profits today are lower than the profits in many prewar years. By restraining their pricing policies, chemical companies have made a distinct contribution to the nation's economy.

The present cost and price structure of the chemical industries is heavily dependent on large volume. It is thus more exposed to strain if sales and output should decline, than at any time since prewar. But the industry is bold and adventurous. Expansion programs in the field of new products is not expected to decline since the demand by all industry for synthetics shows no signs of decreasing. The long-term investment aspects of the industry seem to be well-defined, even though they may in some cases be temporarily suspended due to high prices. New markets have been developed and requirements for meeting these through new products have tremendously stimulated the chemical industry. It is the one industry in the light of a thorough analysis of the hundreds of new products and their uses, which bids fair to ignore the possibility of a severe recession.

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How Process Equipment Costs Have Varied

TABULATED below are the annual average indexes of comparative equipment cost for eight process industries and four related industries, prepared by the Chicago and Los Angeles evaluation engineering firm of Marshall and Stevens. Extending from 1913 through 1948, the annual averages are supplemented by a tabulation of quarterly figures appearing at the right.

A quarterly revision in this form has been appearing regularly in our issues of February, May, August and November for the past year. This feature was introduced initially on pages 124-6 of our November 1947 issue, in an article by the late R. W. Stevens, partner of the firm, which described the basis for the 47 industry indexes regularly issued by the firm, and the method of weighting of the process industries to secure their average. This is accomplished by assigning a percentage to each, according to total value of product in a typical year.

Charted above is the M. & S. 47-industry average plotted for comparison on the same grid with the Austin Co.'s index of industrial building costs, and the *Engineering News-Record* index of heavy construction costs.

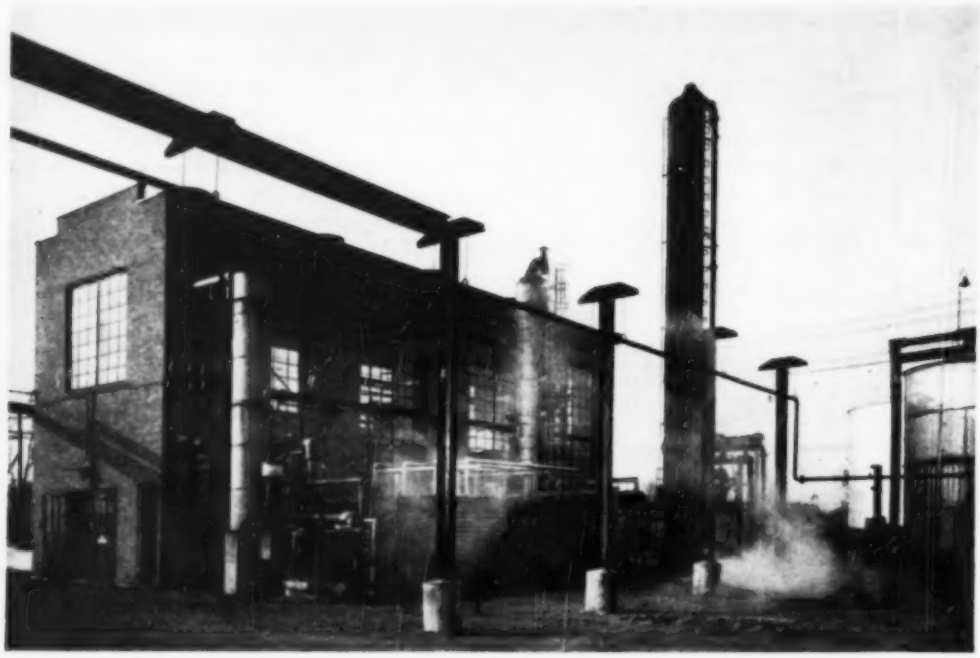
Marshall and Stevens Quarterly Indexes of Comparative Equipment Costs (1926 = 100)

Industry	Dec. 1947	Sept. 1948	Dec. 1948
Average of all	155.2	168.5	166.0
Process Industries			
Cement mfg.	148.7	160.5	159.8
Chemical	156.5	168.5	167.8
Clay products	144.6	155.5	154.8
Glass mfg.	146.8	158.6	157.9
Paint mfg.	150.8	161.8	161.1
Paper mfg.	151.4	162.1	161.4
Petroleum ind.	153.0	164.9	164.2
Rubber ind.	155.4	167.3	166.6
Process ind. avg.	154.2	165.9	165.2
Related Industries			
Elec. power equip.	154.3	170.1	169.4
Mining, milling	157.2	169.2	168.5
Refrigerating	168.3	181.5	181.3
Steam power	146.4	157.2	156.5

Marshall and Stevens Annual Indexes of Comparative Equipment Costs, 1913 to 1948 (1926 = 100)

Industry	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Average of all	57.9	54.1	55.9	62.8	81.5	109.7	122.0	153.3	115.5	85.5	97.8	105.3	105.3	100.0	96.0	96.5	91.9	87.0
Process Industries																		
Cement mfg.	58.0	55.0	55.0	62.5	80.4	109.1	118.4	149.2	112.6	83.7	95.9	104.6	104.7	100.0	96.5	97.2	92.5	87.0
Chemical	59.0	55.0	56.6	63.0	81.2	111.9	120.6	150.5	113.9	87.5	95.0	105.6	107.2	100.0	100.0	96.9	92.4	82.0
Clay products	60.7	56.7	58.1	65.3	84.6	120.0	128.8	154.3	116.6	82.9	96.6	105.7	105.8	100.0	96.5	97.0	91.7	86.1
Glass mfg.	58.7	54.5	56.2	63.5	83.5	112.1	121.9	151.1	114.7	83.7	96.3	101.9	104.5	100.0	96.2	95.9	92.1	86.6
Paint mfg.	58.2	55.2	55.8	62.8	80.0	108.0	119.8	148.5	116.3	84.1	95.8	104.0	103.4	100.0	94.1	94.6	91.7	85.7
Paper mfg.	60.4	55.3	55.8	63.4	81.0	111.8	121.4	152.6	114.8	83.1	95.6	105.6	106.3	100.0	96.2	96.8	90.9	86.5
Petroleum ind.	58.9	55.1	56.6	64.1	83.2	113.0	122.1	151.5	116.4	82.7	96.3	106.0	105.0	100.0	96.5	97.1	92.0	86.2
Rubber	58.6	55.6	57.4	63.8	81.7	113.8	123.3	154.2	116.2	88.0	96.3	105.9	108.7	100.0	96.4	91.9	91.9	86.2
Related Industries																		
Elec. power equip.	59.1	55.2	56.7	64.3	83.1	114.2	128.6	152.2	116.0	83.6	96.2	105.0	104.9	100.0	96.2	96.9	91.8	86.1
Mining, milling	56.8	55.8	56.5	62.9	82.0	111.9	120.3	149.9	114.1	82.8	95.3	105.6	107.1	100.0	96.7	97.2	92.9	86.7
Refrigerating	59.3	56.3	57.1	63.2	83.2	113.5	122.9	153.5	116.7	83.9	96.5	106.1	109.9	100.0	96.3	97.0	92.0	86.4
Steam power	59.1	56.2	56.8	64.5	83.1	114.2	127.6	152.2	115.7	82.7	96.3	106.1	105.0	100.0	96.4	96.9	91.8	86.2

Industry	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Average of all	76.9	66.1	69.4	74.6	78.0	81.6	88.3	84.4	84.8	86.6	92.6	99.6	100.5	102.4	103.4	123.2	150.6	162.8
Process Industries																		
Cement mfg.	76.8	68.9	70.7	75.7	78.1	82.2	88.8	85.2	84.6	85.4	90.8	97.8	98.3	98.6	99.4	119.7	144.3	156.5
Chemical	78.0	77.6	70.9	75.4	78.5	82.5	88.2	84.4	83.8	84.6	93.3	102.0	103.1	105.6	106.5	126.8	151.5	164.5
Clay products	78.0	70.6	71.1	75.7	79.3	82.8	87.8	83.2	82.7	83.7	87.6	93.1	93.6	93.9	94.8	115.0	139.8	151.5
Glass mfg.	77.9	69.4	71.2	75.4	78.5	82.6	88.0	83.4	83.0	84.3	88.2	93.7	94.7	96.5	97.4	117.6	142.3	154.6
Paint mfg.	76.6	71.7	70.1	74.6	77.2	81.5	87.4	83.9	83.9	84.9	90.3	97.3	98.3	100.1	101.0	121.2	146.0	157.8
Paper mfg.	77.1	67.2	69.9	75.4	78.5	82.7	88.1	84.8	84.1	85.1	90.5	97.5	98.7	101.3	102.2	122.4	147.0	158.1
Petroleum ind.	77.6	70.1	70.6	76.0	78.7	82.6	87.8	83.3	82.3	82.8	88.2	95.2	96.7	100.0	100.9	121.6	147.7	160.9
Rubber	77.0	67.1	70.7	75.2	78.1	82.2	88.4	85.4	85.3	86.3	94.2	102.7	103.7	105.5	106.4	126.6	151.2	163.3
Process ind. avg.	77.7	73.2	71.3	75.5	79.0	82.4	88.2	84.3	83.6	84.4	91.5	99.2	100.6	102.9	103.8	123.0	149.2	161.9
Related Industries																		
Elec. power equip.	78.1	70.1	70.7	75.5	78.7	82.7	87.9	84.3	84.1	85.8	90.5	96.5	97.5	99.3	100.2	122.9	150.0	160.1
Mining, milling	76.8	67.6	80.0	85.6	88.5	92.4	97.1	92.6	92.1	93.1	98.5	105.5	106.2	107.3	108.2	128.4	153.6	165.2
Refrigerating	75.0	70.0	71.3	75.4	78.9	83.0	87.8	83.0	82.1	83.1	89.0	95.8	97.0	100.1	101.7	125.7	162.2	178.7
Steam power	88.1	70.1	70.7	75.5	78.7	82.7	87.6	82.9	81.7	82.7	88.6	97.1	97.8	83.9	94.8	116.0	141.7	153.2



New formaldehyde plant showing air scrubber, trombone cooler, secondary absorber, distilling column and storage tanks.

Durez Synthesizes Formaldehyde

One of the largest makers of phenol-formaldehyde resins is now synthesizing both of the major chemical raw materials needed for this important plastic.

CHEM. ENGINEERING PICTURED FLOWSHEET ON PAGE 146 • PHOTOS BY ELWOOD M. PAYNE

Theodore R. Olive
Associate Editor
Chemical Engineering

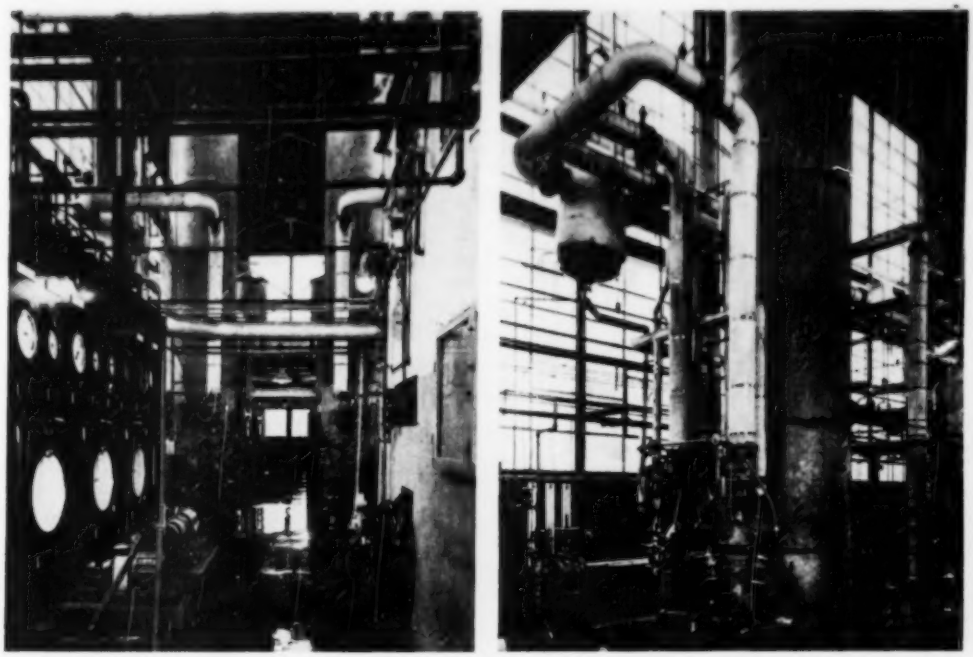
SHORTLY before the last war Durez Plastics & Chemicals, Inc., launched a policy of synthesizing its principal raw materials. At that time the company began the production of phenol by the Raschig vapor phase regenerative process. (See *Chem. & Met.*, Nov. 1940, p. 770.) Last spring a second raw materials operation went on stream within the grounds of the main factory at North Tonawanda, N. Y. Formaldehyde is now being produced by the oxidation of methyl alcohol, in a plant designed and constructed by Chemical Construction Corp. Thus, the second of the two principal raw materials needed for phenol-formaldehyde resins is now being produced as an adjunct to the resin plant, with consequent simplification in the company's problems of raw material supply.

Formaldehyde enters into commerce as formalin, a 37 percent solution by weight of HCHO in water, which may contain up to 8 percent methanol. During 1944, the last year for which a breakdown is available, over 50 percent of the formalin produced went into resin manufacture, about 41 percent into making other chemicals. Total United States production of formalin was roughly 308,000 tons in 1947, and is estimated to have reached about 300,000 tons in 1948.

Rated capacity of the new Durez plant is about 10,000 gal., or 91,000 lb. of formalin per day. There is evidence, however, that the plant could be operated at considerably over this rated capacity if desired. The process makes use of catalytic oxidation and accomplishes a conversion of about 65 percent per pass. It is, therefore, necessary to recycle unreacted methanol. Less than 1 percent of methanol is left in the finished product.

Before taking up the process in detail it will simplify matters to consider the over-all process briefly. (For a Pictured Flowsheet, see pp. 146-149.)

Formaldehyde is formed by two reactions, both of which occur simultaneously. Under proper operating conditions about 55 percent of the



Inside the plant, looking toward the primary absorbers and burners; close-up of one absorber tower and burners at right.

formaldehyde results from the exothermic oxidation:

$$CH_3OH + \tfrac{1}{2}O_2 \rightarrow HCHO + H_2O + Heat$$

while about 45 percent is formed by the endothermic dehydrogenation reaction:

$$CH_3OH \rightarrow HCHO + H_2 - Heat$$

Parasitic reactions result also in the formation of minor percentages of CO and CO_2, while a dirty catalyst can produce some formic acid, HCOOH; and failure to cool the reaction gases quickly can produce methylal, $HCH(OCH_3)_2$, from interaction of CH_3OH and HCHO.

On the surface, the process is quite simple. There are, however, various less simple aspects which will be touched on in more detail at a later point. Washed air and methanol vapor are mixed in roughly equal proportions, volume-wise, and passed through a bed of prepared silver catalyst where controlled combustion at about 635 deg. C. yields a mixture of HCHO, CH_3OH, H_2O, CO, CO_2, H_2 and N_2. Ordinarily the mixture contains not over 5 percent CO_2 and 1 percent CO, while it should run from 18 to 20 percent H_2, with 18½ as a good average.

The burner (converter) gases are quickly quenched by contact in a packed tower with a flow of cooled liquid known as "F-M liquor." This liquor, which is the primary absorption medium for the formaldehyde and unreacted methanol, is recirculated over the primary absorption towers and through a trombone cooler, and contains about 28-30 percent formaldehyde and 22-20 percent methanol.

The gases leaving the primary absorber pass through a blower into a secondary absorber where the last traces of HCHO and CH_3OH are absorbed in cool distilled water. The weak liquor so formed is the make-up for the primary absorber. A small stream of F-M liquor removed continuously from the primary absorber is pumped to a fractionating column where the bulk of the unreacted methanol is separated from the formalin for recycling to the process. Here the overhead product—methanol—is used for reflux on the column, with the excess recycling, while the underflow is cooled and pumped to the finished formalin storage tanks.

Process Details

In spite of this apparent simplicity, the plant has many interesting characteristics and involves a number of complications. Methanol is received in tank cars and is pumped by an unloading pump to any one of four 61,000-gal. steel storage tanks in a tank farm surrounded by concrete dikes. This provides sufficient storage capacity for 35 to 40 days of plant operation. The tanks are protected by a fire foam system and each is provided with a flame arrester, conservation vent, and inclosed type tank gage. Two feed pumps are provided for withdrawing methanol from the tanks and delivering it to the vaporizer. A bypass jumper containing a back-pressure relief valve is connected from the discharge of the feed pumps to the discharge of the unloading pump so that, normally, part of the methanol is continuously returned to the tank from which it was pumped so as to maintain delivery to the vaporizer only at the rate momentarily required. An unusual feature of this set-up is that the relief pressure is below the discharge pressure of the recycled methanol pumped back to the vaporizer, so that it is possible for recycled methanol actually to be returned to the storage tanks if at any time it is not being taken by the vaporizer.

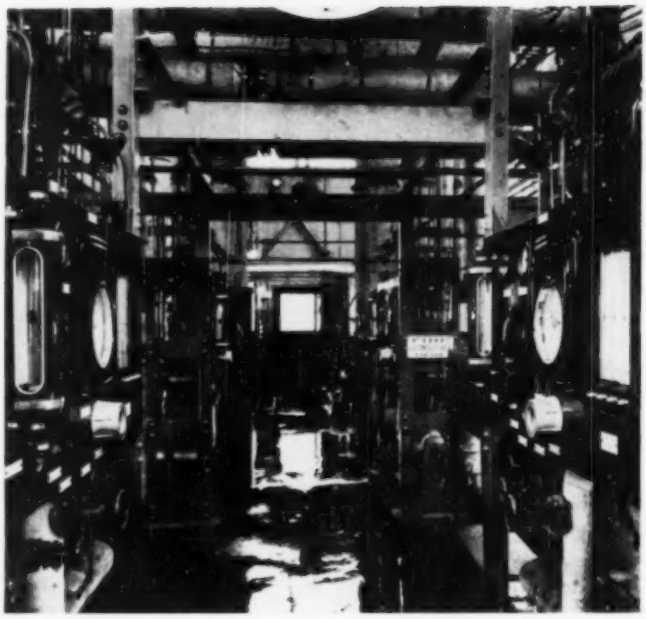
The second raw material, air, is filtered through a wire mesh filter, and drawn into the base of a packed tower in which it is washed with a recirculated caustic soda solution pumped

over the tower. This treatment removes both carbon dioxide and sulphurous compounds from the process air. The latter compounds are injurious to the catalyst, the former harmless.

From the air-washing tower, air passes through a fin-tube heater where it is heated to 70 deg. C. before being mixed with methanol vapor. Methanol from the tank farm, as well as recycled methanol from the final distilling column, is pumped to a vaporizer which is a steam heated horizontal cylindrical vessel designed to produce methanol vapor at about 85 deg. C. and 18 psig. The level in the vaporizer is controlled automatically by an external "kidney" which regulates the methanol inlet valve. Steam to the tubes is controlled automatically by pressure of the methanol vapor. Vapor leaving the vaporizer passes through a double-pipe heater known as the superheater, which is provided to insure evaporation of any liquid entrainment that may be carried over. Steam for the superheater is taken directly from the 85-lb. supply line and is not controlled.

Methanol vapor passes from the superheater through a flow control valve into the heated air line, mixing with the air and flowing through a filter which has the dual purpose of removing dirt and scale, and of completing the mixing operation. A critical factor in the operation of the plant is the suitable proportioning of methanol and air. Methanol's explosive limits are variously stated by different authorities, but may be considered to be from 6.72 to 36.5 percent methanol by volume. This means that for safety it is necessary to operate at all times on the high side. That is, the methanol percentage must be well above the upper limit. In practice, the air and methanol are carried at about equal volume percentages, control being accomplished by a ratio flow controller which meters the air flow and controls the flow of methanol vapor.

The proportioned mixture of methanol and air flows through the filter previously mentioned and then to the burners or converters. These burners are arranged in groups of three, each such group discharging directly into one of the primary absorbers. This arrangement gives the plant a high degree of flexibility and a broad turndown range. The burners, a modification of the standard Chemico ammonia converter, are jacketed vessels containing a bed of prepared silver catalyst. They operate at a temperature from 450 to 650 deg. C., with the preferred temperature at about 635 deg. C. To maintain the reaction temperature below the top limit, the burner is



Control units of two of the converter-absorber units; a ratio flow controller is used to proportion the methanol and air so as to prevent possible explosive mixtures.

equipped with bayonet-type cooling tubes for either steam or water cooling. When water cooling is employed, it is necessary to use an inclosed distilled water system in series with a heat exchanger to avoid deposition of scale within the tubes.

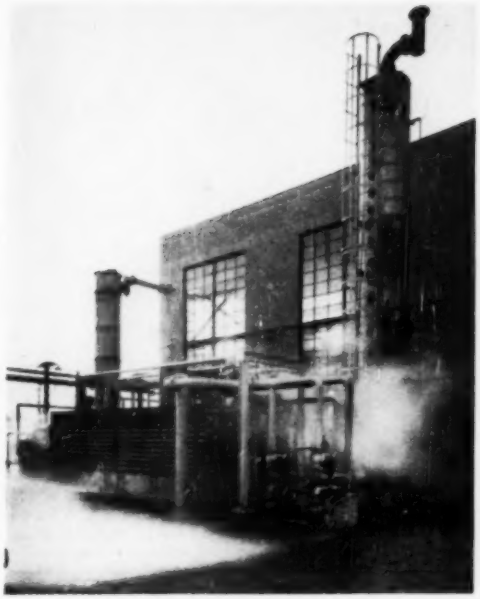
Each burner is provided with a flame arrester at the entrance to prevent possible flash-backs; and with sight glasses and an air inlet for starting operations. There is also an auxiliary methanol inlet for emergency use in quenching. Ports are provided for insertion of the igniter and thermometer wells.

Absorbing Burner Gases

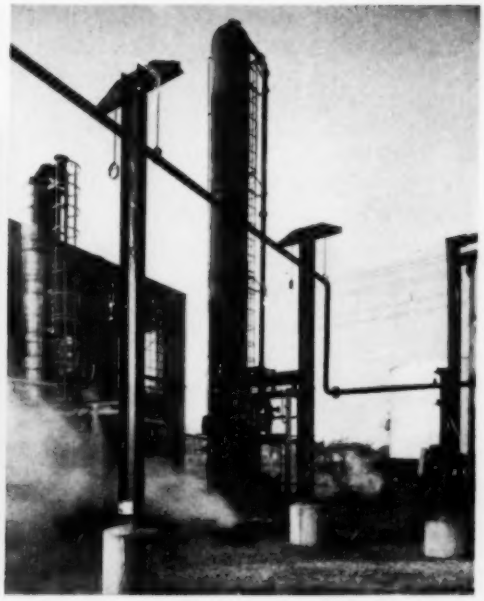
To avoid decomposing the formaldehyde it is necessary for the superheated vapors from the burners to be cooled immediately. The burners are, therefore, attached directly to the lower portion of the primary absorber towers. The towers are packed with Raschig rings and are provided with a rather heavy flow of cooled recirculating liquor. This liquor, introduced at the top of the tower, consists of about 28-30 percent formaldehyde, and 22-20 percent methanol in water solution. It is the previously mentioned F-M liquor. The liquor leaving the bottom of the tower is pumped through a group of externally water-cooled trombone coolers. An interesting feature of their design is the use of a fin welded to the bottom of each tube to serve as a distributor for the water flowing to the next lower tube. This considerably decreases water loss by splashing.

The F-M liquor, containing the unreacted methanol as well as the formaldehyde produced, builds up in quantity gradually and the excess is automatically withdrawn to the F-M tank where it is held prior to final distillation. The rate of withdrawal is automatically maintained by a liquid level controller in each primary absorber.

Gases leaving the top of the primary absorbers flow through a Roots blower and enter the bottom of the single secondary absorber. This column serves all of the primary absorbers. It completes the stripping of formaldehyde and methanol from the gases leaving the primary absorbers and vents the residual non-condensibles at its top. The absorption medium for this tower is a flow of distilled water which consists of the condensate collected from various steam users in the plant, including the final column reboiler, the superheater and vaporizer, the unit heaters, air heaters and the steam main. The condensate from the collecting tank is pumped through a cooler before it enters the column. Liquid collecting in the base of the column flows through rotameters to the primary absorbers.



This is the secondary absorber for formalin, to the right of the caustic air washing tower and the trombone cooler.



Shown here is the continuous fractionating column employed to separate F-M liquor into recycle methanol and product.

As was mentioned above, the F-M liquor withdrawn from the primary absorbers is collected in a tank which serves as a buffer between the absorbers and the distillation system. The distilling column, operated under a vacuum, produces an overhead product containing not less than 99 percent methanol and a bottoms product containing less than 1 percent methanol. Feed is pumped from the F-M tank to one of the plates in the intermediate section. Methanol vapors from the top of the column are condensed and collected in an accumulator from which the greater part is pumped back to the top for reflux, while a small excess returns to the vaporizer as recycle methanol. The tower is heated by means of a reboiler, with a temperature controller maintaining a set temperature on one of the lower plates.

A level controller in the tower bottom automatically withdraws the product which is cooled by a primary cooler and then pumped through a final cooler to one of two product storage tanks provided with heating coils, level gages, and agitators. When a tank has been filled it is agitated for at least two hours to insure uniformity. Samples are then taken and enough water added to bring the solution to 37-37.5 percent formaldehyde. After this, the tank is again agitated before the product is pumped to the resin plant.

The plant is heavily provided with automatic instrumentation, alarms and signals, with many interlocks for safety purposes. All flows are automatically controlled and many are recorded. Vapor-proof lighting fixtures and explosion-proof power transmission and utilizing equipment are employed throughout the plant. Much care has been given to fire safety, with the building equipped with dry chemical extinguishers and a wet-type sprinkler system, and the tank farm protected by Alcofoam. A full complement of safety clothing and Air-Pak masks is also provided. Rigid requirements for plant housekeeping are part of the safety program, which is still further advanced by the use of safety painting of moving parts and color coding of all pipelines in accordance with a general plan presented in ASA Bulletin A-13-1928.

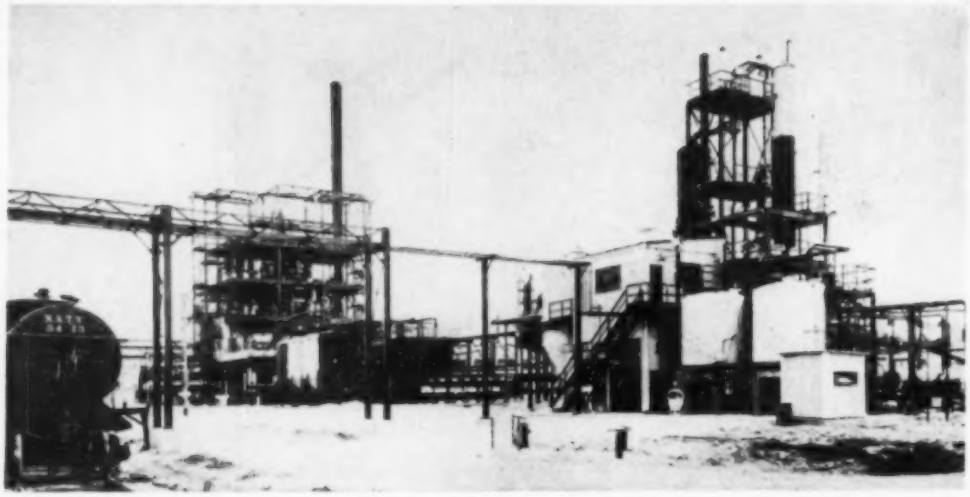
Operation

So far as possible, automatic safety controls and interlocks relieve the two operators per shift of the need for manual operation in the event of any emergency. There is, however, a rigid operating procedure established for all possible contingencies, including start-up, shut-down and emergencies due to power failures or other unusual happenings. There are, for example, automatic devices which shut down the air supply and turn off the gas blowers if any burner exceeds predetermined temperature limits. The vaporizer is equipped with high and low pressure alarms and automatic controls.

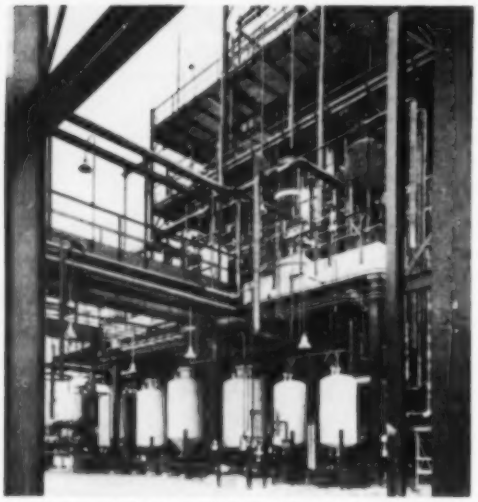
When starting up the plant, it is necessary to control the vaporizer manually until an approximately correct ratio of methanol to air is secured. Burners are lighted manually at a low rate of flow, using an electric igniter and injecting a small flow of air through an auxiliary air valve until the catalyst bed becomes activated as shown by a slight glow. The temperature is watched closely during the starting period and the flow is increased to regular operating rates slowly over a period of about four hours.

When shutting the burners down, the methanol ratio is increased, but the rate is decreased to cool the burner before the blower is shut down and the methanol is shut off. In either starting or stopping it is, therefore, essential to make certain that the methanol percentage is well above the explosive limit at all times.

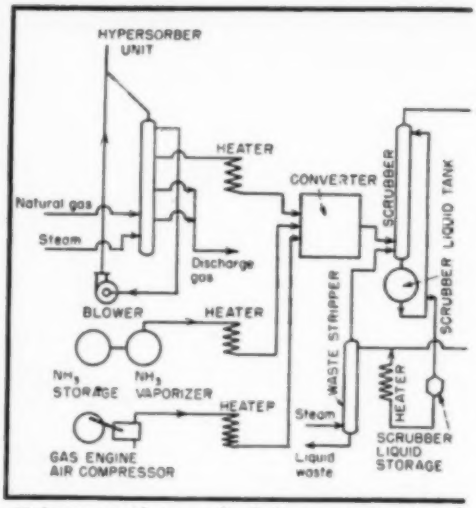
Grateful acknowledgment for permission to visit the plant and for assistance with the manuscript is made to David D. Locke, chief chemical engineer of Durez, to members of his staff, and to the Chemical Construction Corp. of New York.



Hydrogen cyanide produced by direct synthesis and the intermediate, acetone cyanhydrin, are made in unit on left. A second intermediate, ethylene cyanhydrin, is produced in unit on right. These products are made near Houston by Rohm & Haas.



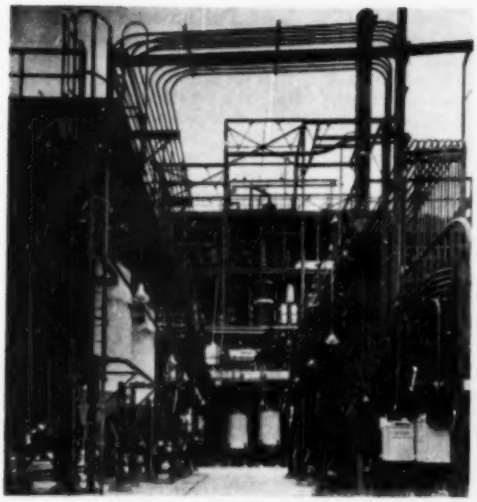
Acetone cyanhydrin is made from hydrogen cyanide in this unit and later used in production of plastics.



Hydrogen cyanide is produced from ammonia, air and natural gas, conversion taking place on a platinum cata-

Hydrogen Cyanide Production

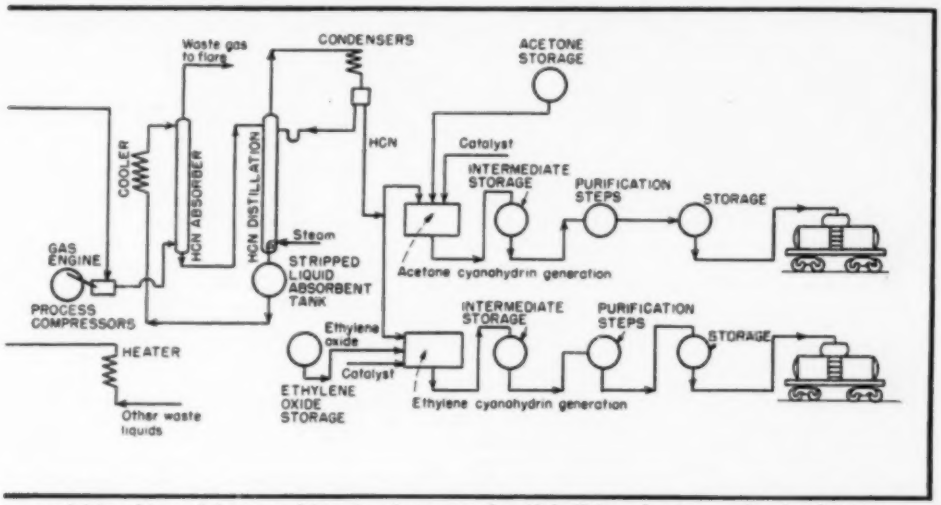
The first plant ever built for the large-scale production of hydrogen cyanide by direct synthesis has recently been completed near Houston, Tex., by Rohm & Haas.



Acetone cyanhydrin is purified in the filter press and other equipment in the rear center of this picture.



Part of the hydrogen cyanide is converted to ethylene cyanhydrin in this unit. Cooling tower in background.



lyst at a bright red heat. It is separated from the other gases and purified. This product is pumped to the adjoining processing units where it is converted into acetone cyanhydrin and ethylene cyanhydrin.

James A. Lee

Managing Editor
Chemical Engineering

HYDROGEN cyanide is now produced by direct synthesis on a large scale by the Rohm & Haas Co. in its new Deer Park plant, along the Houston Ship Channel below Houston, Tex. At present, most of the output goes into the production of acetone cyanhydrin and ethylene cyanhydrin. These chemical intermediates are shipped to other plants of the company where they are used in manufacturing acrylic resins and other products.

Raw materials for the process consist of ammonia, air, and natural gas, which is predominantly methane. The gas is brought to the plant in a steel pipe line and purified for use in a Hypersorber. The ammonia arrives in

tank cars and is unloaded by a small compressor into steel pressure storage tanks. Since the tanks are small, refrigeration is not required. The tanks were designed for 300-lb. pressure.

In the process, the ammonia is passed to steel evaporators equipped for recovery of refrigeration. Air is prepared by air compressors driven by gas engines. The air is purified. All three streams are heated, metered at a definite pressure, and passed to a converter in which the reaction takes place on a platinum catalyst at a bright red heat.

Since the reaction for the synthesis of hydrogen cyanide is endothermic, the gas is stable at high temperatures. Gases from the converter are scrubbed to remove unconverted ammonia and are then passed through a process compressor and an absorber in which the hydrogen cyanide is removed from the gas by means of a liquid absorbent. The waste gases are then burned in a flare stack.

The rich solution of hydrogen cyanide from the absorber passes to a distillation column in which the hydrogen cyanide is distilled out at high purity. The condensed, purified hydrogen cyanide boils at 26 deg. C. and is handled with refrigeration to prevent loss by evaporation.

Because of the hazardous nature of the cyanide, the volume stored is kept to a minimum—surge tank only. The full production is pumped at once by a sump type pump to the adjoining processing equipment where it is converted into the intermediate chemicals previously mentioned: acetone cyanhydrin and ethylene cyanhydrin.

Reaction Differences

For the manufacture of acetone cyanhydrin, the usual reaction, described in the literature, shows acetone reacting with hydrogen cyanide in the presence of an alkaline catalyst with the evolution of some heat. The reaction is an equilibrium reaction which is displaced toward completion by reduction of temperature. Upon obtaining equilibrium, the reaction can be stopped by neutralizing the alkaline catalyst.

In the case of ethylene cyanhydrin, the literature shows the reaction between ethylene oxide and hydrogen cyanide as being catalyzed by alkalis, but this reaction is not reversible and the heat evolved is much greater. The cyanhydrin, after being formed, is passed through purification stages before shipment.

These two products of the Deer Park plant are shipped in steel tank cars to the Knoxville, Tenn., and Bristol, Pa. plants of Rohm & Haas. In these plants, acetone cyanhydrin, together with methanol, is used in making methyl methacrylate monomer. The monomer, in turn is used in making Plexiglas sheet plastic, Plexiglas molding powder, and other products.

The ethylene cyanhydrin, for the most part goes into the production of acrylates, of which Rohm & Haas is a large producer. These acrylates are used in many products, including coatings for leather, finishes for textiles, and adhesives.

Plexiglas sheet, in order to insure its optical clarity, is made under rigid conditions of purity and cleanliness. In a room resembling the spotless character of a hospital, with employees wearing white, lintless, uniforms, the glass molds in which the sheets are formed are prepared. The operations include filling the mold with weighed quantities of liquid monomer, heating in polymerization ovens where the liquid changes to a solid plastic, removal from the mold, annealing, and inspecting. The finished sheets are then masked and properly packed for shipment.

Transparent Sheet Outlets

Sheet Plexiglas and molding powder have many uses. The largest single outlet for transparent sheet is in the making of canopies and other enclosures on aircraft. Colored as well as transparent material is used in signs, in lighting, in store fronts, in inside and outside architectural applications, and in hundreds of other ways. The molding powder finds use in the automotive field, where it is used in lighting and ornaments; in radio dials and cabinets; in household appliances; and in innumerable other places where a large quantity of identical, relatively small parts are required.

It was the steadily widening field of usefulness for acrylic plastics and other materials based on the acrylic intermediates, coupled with the persistent shortage of sodium cyanide (previously used as the chief source of hydrogen cyanide), that prompted Rohm & Haas to turn to the large scale synthesis of hydrogen cyanide and resulted in the erection of the Texas plant.

Materials of Construction

The Deer Park plant uses several types of stainless steel as well as lead and several alloys. Type 316 stainless is used for towers and piping for the handling of moderately corrosive materials. Type 304 stainless is used where there is practically no corrosion, but where it is necessary to avoid contamination. Types 309 and 310 are used for high temperatures. Worthite and Durimet 20 are used for pumps and valves throughout the plant. Lead is used where the solution contains weak sulphuric acid.

It is the mineral acid used for stabilizing the hydrogen cyanide that is corrosive. Pure hydrogen cyanide can be shipped in steel cylinders.

Both intermediates are made with plain steel equipment, except in a few pieces of equipment which are constructed of stainless steel.

Safety Measures

Interlocking controls in the instrument room are sleepless sentinels that guard against disastrous happenings. With a minimum of attention from the operator, the instrument keeps the plant working properly or shuts it down in safe, orderly manner if something should go wrong.

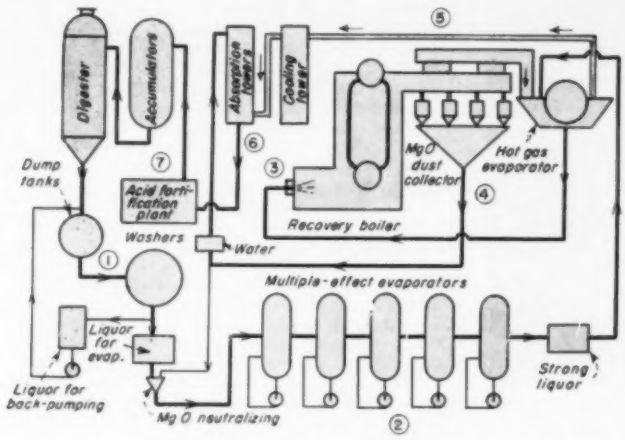
All instrumentation is air-operated and the air supply is insured by having a large storage tank which is maintained at high enough pressure to give ample supply for orderly shutdown in case of extended electrical power failures. In addition, provisions have been made for emergency shutdowns in two steps which may occur automatically in case of various process troubles.

The first step involves releasing the converter gases to a vent stack in which they are diluted with a large volume of air supplied by steam turbine-driven blowers in duplicate. The discharge from this stack is at a high level and at sufficient velocity to insure good mixing and further dilution. The emergency shutdown system involves the use of air-operated diaphragm motor valves which are controlled locally for fast response by direct current-operated solenoid pilot valves. The current is supplied by a storage battery system which is kept continuously charged.

The second stage of emergency shutdown involves shutting down converters by shutting off each of the three feeds. This occurs, for example, if the flow of any one of these feeds falls below a set point which might involve an undesirable change in the composition.

Process engineering for the Texas plant was done by the Rohm & Haas engineering staff under the direction of Dr. David R. Merrill with W. A. Perry as project engineer. The Foster-Wheeler Corp. was retained to build the plant.

Construction began in the spring of 1947, and for the most part the installation is of the outdoor refinery type, a design that suits both the climate and the process. The plant was completed by the middle of 1948, and a few weeks later it was in full-scale production.



Its Advantages Are Impressive

One basic change, MgO instead of CaO, may set off a revolutionary trend in the sulphite pulp industry. Reasons:

- Enables recovery of chemicals
- Eliminates stream pollution
- Provides energy for electric power
- Aids fuller utilization of timber
- Holds possibility of better pulp

The new process, now getting its first commercial trial, runs through its cycle in seven steps; they're numbered in the flowsheet and the text below.

Magnesia Pulping Process

John R. Callaham

Pacific Coast Editor, *Chemical Engineering*

FOR four-fifths of a century, engineers in the sulphite pulp industry have tried to find the answer to two problems: How can we recover—economically—more of the chemical and energy values from our pulping waste liquors? How can we eliminate—economically—the stream pollution that these liquors cause?

Now some engineers believe that the answers may be found in a process which makes one basic change in the method that has been used by pulp mills for 81 years: It substitutes magnesium oxide for lime. The world's first plant to try out the process on a commercial scale has been put into operation by Weyerhaeuser Timber Co. at Longview, Wash. The performance of this plant within the next year—the technical and economic data that only full operations can supply—will show whether the process is the full answer or only a part answer to the pulper's problems. If it proves to be the full answer, its effect on many facets of the sulphite pulp industry will be near-revolutionary. Here are . . .

. . . The Seven Cyclic Steps . . .

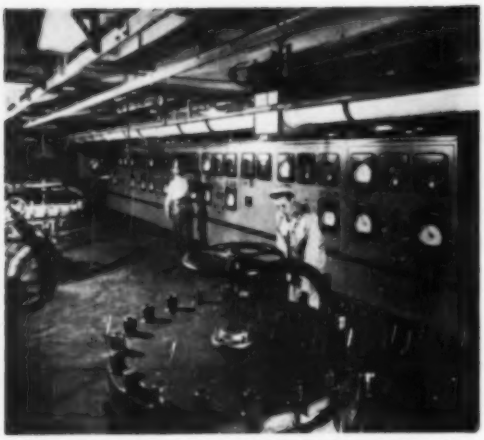
. . . that are used in the Weyerhaeuser plant at Longview (see flowsheet): (1) cooking of wood chips in an acid made from action of SO_2 on MgO slurry, followed by dumping and washing of the pulp; (2) evaporation of the sulphite liquor from 12-14 percent solids to 50-55 percent solids; (3) incineration of the liquor concentrate to provide heat for the boilers and to recover reactive MgO; (4) separation of MgO dust and SO_2; (5) cooling of flue gases containing the SO_2; (6) slurrying the recovered MgO in water and reacting it with recovered SO_2; (7) fortifying the weak acid from the absorption towers with SO_2 to form a magnesium bisulphite:free-SO_2 acid for reuse in the process. Thus the cycle is completed.

From Idea to Output

It was almost 15 years ago that George H. Tomlinson of Howard Smith Paper Mills, Ltd., made the basic discovery. He found that if MgO is used in wood pulping liquors, these could be evaporated and burned to give a high oxide recovery (this cannot be done with CaO in the process now used). Tomlinson patented the method. Babcock & Wilcox Co., working with Tomlinson, developed suitable boiler designs; a pilot plant was put into operation in 1937 at the Howard Smith plant at Cornwall, Ont.

Meanwhile, scientists at Weyerhaeuser Timber Co. had started independent research along the same lines. A pilot plant was set up at Longview under the supervision of Research Director R. S. Hatch. One Weyerhaeuser commercial digester was operated for almost a year on a MgO base; liquor from this was concentrated and burned in the pilot plant furnace. Data from these operations convinced company engineers that the new process was commercially feasible.

But shouldn't the three firms get together, combine their research efforts and do away with expensive duplication of work? They did, and chose Weyerhaeuser's Longview mill as the site for the first commercial unit. The war delayed the project—but did not stop it—so that construction was not begun until 1946. The plant was designed by O. C. Schoenwerk, a consulting engineer of



DIGESTERS (WHERE MgO AND SO_2 ENTER PROCESS)
At good as the standard CaO-base liquor

Chicago. It began operations last September, and when running at full capacity within several months will turn out 275 tons of MgO-base bleached sulphite pulp daily.

Other Weyerhaeuser men who have had important parts in the development are Robert B. Wolf (retired) who, as manager of the firm's pulp division, sponsored the pilot plant and commercial unit; Howard W. Morgan, present manager of the pulp division; Raymond E. Baker, manager of the Longview pulp division; Don Felthous, plant engineer for the Longview pulp division; Harold Bialkowsky, present director of research for the pulp division—and the many engineers and chemists who contributed to the project.

Licenses to use the patented process will be granted by Babcock & Wilcox Co., exclusive licensing agent. Terms will be designed to stimulate widespread use of the new process by sulphite pulp mills throughout the world.

Why So Important?

To understand the full potential of the cyclic magnesia-base process, we must first review the limitations of the present non-cyclic calcium-base method and how the new process is expected to remove them.

Sulphite pulp is normally processed by cooking wood chips with an acid made by the action of SO_2 on limestone in the presence of water. A ton of organic solids is produced as a byproduct for every ton of pulp manufactured. In spite of decades of research, engineers still find that *most* methods for utilizing this waste are not satisfactory because of chemical or mechanical difficulties; recovery of commercially salable products from lignin in the pulping liquor involves costly marketing procedures. Thus, from most sulphite pulp mills large volumes of waste liquors go down into the sewers and streams to become—often but not always—a serious pollution problem; at the same time they carry away most of the chemicals used in the process and big tonnages of potentially valuable organic solids (some 50 percent of the raw wood charge).

But the Weyerhaeuser unit is showing what can be done if magnesia is used instead of lime in the pulping process: (1) the liquors can be evaporated and burned to recover for reuse almost all of the MgO put into the system; (2) at the same time, the organic solids are concentrated and burned as a fuel under steam boilers; (3) the sawmill waste wood that was previously burned as a fuel can now be used for making kraft pulp, thus upgrading its value and contributing to the fuller use of our timber resources; (4) stream pollution caused by discharge of waste liquors will be eliminated; (5) a higher quality of pulp will probably be made since the magnesium compounds are more soluble than calcium salts and can be washed out more completely.

It isn't as simple as all that, of course, for the process requires much special equipment and many new processing steps. Here are the details.

Wood chips are cooked in the magnesium bisulphite-SO_2 acid in eight digesters, each with a charge capacity of about 35 air-dry tons of wood. At the end of the 8 hr. cooking period (about the same as for the conventional lime process), the digester is gassed down quickly to atmospheric pressure to recover all available SO_2. Instead of blowing pulp from the digester—as in the normal sulphite process—it is washed out continuously with waste liquor into four large steel "blimps" or dump tanks that are lined with acid-resistant brick. These procedures require a special-design blow-down cooler and a low-pressure relief system. Each pair of dump tanks is connected with a stainless steel circulating system driven by a pump. The digesters are lined with acid-resistant brick.

The slurry is pumped—through stainless steel pipe—into Oliver three-stage rotary vacuum washers; these are made of stainless steel and are set in vats lined with acid-resistant tile. Washed pulp goes to the mill to be processed in the usual manner. Washing operations, by the way, are made easier because of the greater solubility of the magnesium compounds; but apparently there will be little, if any, saving in amount of wash water used. The final pulp, on the other hand, will probably have less soluble impurities.

Waste cooking liquor goes into red liquor storage vats. It is neutralized with MgO from the recovery furnace to prevent loss of SO_2, then is sent to the evaporators.

Heart of the Process

It is at this point that we come to the real heart of the magnesia-base process—the evaporation and recovery of chemical values from the cooking liquors. Since MgO is relatively expensive as compared to lime, a high recovery of this chemical is necessary to make the new process economically competitive. Actual recovery of MgO will naturally not be known until the unit operates at maximum efficiency; present estimate is that it will be above 80 percent. At normal capacity operations, some 3-5 tons of magnesia will be needed every eight hours to fill the plant system. The magnesia used is the light-burned type (fairly large surface area) made from California sea water.

Over-all economics of the process are naturally not yet clear-cut. One source—not entirely official, remember—states that the MgO method may shave up to $4.50 a ton from the cost of producing sulphite pulp.

Quintuple-effect stainless steel evaporators of the submerged tube type evaporate the cooking liquor from 12-14 percent organic solids to 50-55 percent. Of forced-circulation type, they can evaporate approximately 4.6 lb. of liquor for each pound of steam. They were specially designed for the new process by General American Transportation Corp. Part of the steam comes from the recovery boiler; direct contact with hot exit gases gives further concentration.

Liquor concentrate—consisting of magnesium-sulphur compounds, lignin and carbohydrates from the wood, and water—is spray-burned in suspension under two 650-lb. extended furnace boilers. Here's what happens: the lignin

and carbohydrates burn to supply energy; magnesium compounds break down into recoverable reactive MgO; sulphur is burned and recovered as SO_2.

The Babcock & Wilcox boilers are specially designed to avoid difficulties with scale formation (with lime liquors, so severe as to make the step impractical). The boilers, rated at 137.5 tons each, can produce 69,600 lb. of steam per hour. It is expected that they will generate enough to furnish most of the steam and power needs of the process. Sulphite recovery furnaces are located in the same building as the kraft recovery furnace and common power generating equipment is used for both mills—a nice example of operating integration.

To produce 285 tons of sulphite pulp a day (the capacity of Weyerhaeuser's Longview mill), 285 tons of organic solids in the waste liquors must be burned. But here's an important angle: sawmill wood waste, which was partially used in the past as hog fuel to produce steam and power for the previous calcium-base sulphite mill, will now be used as raw material in the company's new 200-ton sulphate pulp mill.

The original sulphite mill had been supplied with power from the sawmill station by a single 2,300-v. feeder, which is now abandoned. Instead, the sawmill station and the new power station will be interconnected at 13,800 v., which will be stepped down to 2,300, 550, 220 and 110 v., to serve both the sulphite and kraft pulp mills. Use of a sub-station system and high-voltage braided cable transmission lines: (1) avoids hazards to the system from climatic conditions; (2) assures a voltage of standard rating to individual motors.

The new power station will generate steam at 650 psi and 700 deg. F. It will relieve the sawmill station of about 80 percent of the pulp mill's power demands and also handle the increased load for the pulp mill addition. Turbo-generators will also be interconnected: three units of the sawmill and two of the pulp mill station will provide steam at 135 psi. to a common trunk line which will feed the digesters.

Now Fortify the Acid

Magnesia dust of desired purity and reactivity is collected in multiclones designed by Western Precipitation Corp., then slurried with filtered make-up water. The MgO slurry is next sprayed into the top of three-stage absorption towers of two units each.

Meanwhile, the SO_2-containing flue gases from the furnace are passed upward through two all-steel cooling towers lined with acid-proof tile material. Heat exchangers are cooled with water flowing countercurrent to the gases Cooled SO_2 is then introduced into the bottom of the concrete, tile-lined absorption towers to meet the descending MgO slurry. The two react to form a weak-acid magnesium bisulphite solution; the SO_2-stripped flue gas is vented to the atmosphere. One three-tower absorption series is provided for each of the two boilers.

Bisulphite solution is fed into the top of a two-stage Jenssen acid fortifying system and descends countercurrent to cooled SO_2 from a sulphur burner that is part of the system. The magnesium bisulphite is built up to a free SO_2 content of 3-4 percent. Exhaust gases are fed back into the SO_2 stream entering the absorption system. The strong, raw acid from the fortification plant (which has a capacity of 60 tons) is pumped from the bottom of the system to the acid accumulators; it completes the process cycle by then going to the chip digesters.

The Weyerhaeuser plant is characterized throughout by the use of acid-resistant materials of construction. Stainless steel is used for piping, valves and fittings, pumps, dump tanks, washers, quintuple evaporators, cascade evaporators, cooling towers, heat exchangers and other equipment. Acid-resistant brick or tile is also used in many units; all pulp storage tanks are tile-lined and all towers and tanks exposed to corrosive liquids are lined with either brick or tile, depending on temperature conditions. It is one of the largest jobs of ceramic lining ever installed in a pulp mill: over 71,000 sq.ft. of special acid-proof ceramic linings and 79,000 sq.ft. of tile were installed. Special types of lining brick and bonding material were developed by Stebbins Engineering Corp. for use in the MgO pulping process.

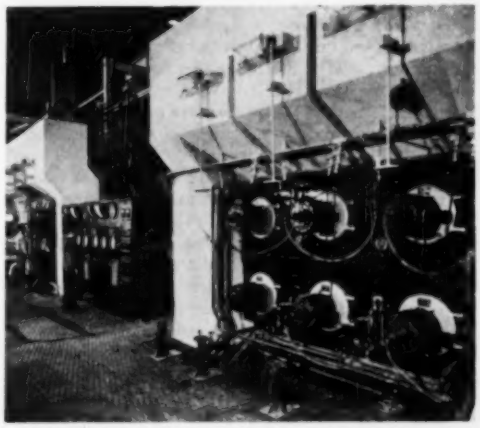
Centralized control instrumentation is also outstanding. One unusual application is in the sulphite digester house: all instruments for the automatic cooking cycle of the eight digesters are grouped in one central control panel. Digester temperature, pressure and steam flow are automatically controlled on a predetermined time schedule. Other instruments on the panel include a flow recorder for top and bottom acid circulation on each digester, recorders for the stock chests, conductivity for heat exchanger and digester dilution tank level.

Automatic control dominates the sulphite acid plant. The sulphur melter temperature, feed level and rate of melting are kept constant. The SO_2 content of the gas is kept uniform by a recording controller. A pyrometer records combustion temperature; pressure control keeps the acid tower pressure at a constant.

The MgO pulping plant is significant in another respect: It completes the wood utilization program at the company's 600-acre Longview site—probably the most advanced program of this kind in the nation. Here are 12 operations, separate yet intimately integrated: three hydraulic barkers, three sawmills, a bark products plant, a plywood plant, a 275-ton sulphite pulp mill, a 200-ton sulphate pulp mill, steam and power generating units and a forest products development laboratory with 75 scientists and engineers.

For Cooperation . . .

. . . and help in preparing this article, the writer is especially indebted to W. S. DeLong and Albert Arnst of Weyerhaeuser's department of public information, to Howard W. Morgan who is manager of the firm's pulp division, and to several persons with Babcock & Wilcox Co.



BOILERS (WHERE MgO AND SO_2 ARE RECOVERED)
Impossible with the standard CaO-base liquor

EDITORIAL VIEWPOINTS

Sidney D. Kirkpatrick and Staff

The High Cost of Secrecy

Now that the political atmosphere has cleared somewhat it is time for a sane appraisal of the atomic energy program. As a brave start in that direction we would strongly recommend that every interested engineer and executive should study the year-end report of the Industrial Advisory Group of the United States Atomic Energy Commission. Under the chairmanship of James W. Parker, president of Detroit Edison (and past president of ASME and ECPD), this group of eight eminent engineers and industrialists spent more than a year in studying the operations of the Commission and preparing a constructive report on some of its problems and shortcomings.

The gist of the report is that the whole program will soon be bogged down in bureaucracy unless some way is found to bring more of the forces of industry into the picture. Spurred by this and similar criticism, the Commission has recently made important contracts with Du Pont and Westinghouse. But what the Parker committee had in mind is a lot broader and more fundamental than any extension of the contract system: "Success in finding solutions for comparable problems in other fields of technology has come about through energetic attack by many competing firms and individuals rather than by any select group."

The Committee would like to see some way found to penetrate the iron curtain of needless secrecy in order that the full capacity of industrial research and competitive enterprise could be focused on the promises as well as the problems of atomic energy. Today there is no way that industry can learn about such prospects because "business neither knows where to look nor what to look for." Even the committee itself, with all the clearances the Commission was willing to give it, was unable to get beyond this "formidable impediment" sufficiently to study and understand all phases of the enterprise.

Because the essential pre-condition to increased industrial participation is knowledge of the subject, the Board recommends that AEC should: (1) Publish immediately the mass of non-secret information now buried in its files—reports on such things as the economics of atomic power, new metallurgical techniques, new chemical means of protecting against corrosion, new plastics, instrumentation and useful technical knowledge of many kinds. (2) Publish fuller reports on its own procedures—such as patent and labor policies, contract administration. (3) Arrange security clearance for engineers, technologists and executives from interested industries, like chemicals, oil, power, and heat-transfer equipment, in order that these men be given an opportunity to keep in touch with atomic energy in the same way they keep informed of other technological developments.

Industry—and the nation—owes a vote of thanks to the Industrial Advisory Group—Bruce K. Brown, Gustav Egloff, Paul D. Foote, Isaac Harter, Sr., Jerome C. Hunsaker, Gabriel O. Wessenauer, Robert E. Wilson and Chairman James W. Parker. The Commission must now prove its sincerity by backing up Mr. Lilienthal's statement: "Unless the initiative, the technical skills, and the managerial ability of American industry are brought to bear with maximum effect on the problems of atomic energy development, the people of the United States will not realize the full benefits of this new field of endeavor." It has long been our opinion that this is the only way for America to stay strong in atomic energy.

Correction Please!

UNOBTRUSIVELY a newcomer appeared on our contents page last month. Under the heading "Every Month" was the listing "Corrections." We are not proud of this added service for the reader. Quite the contrary. It does seem best, however, to let you know when and if there has been a mistake in something you may have read in our columns.

It is practically impossible to give a correction and a mistake equal prominence. But we are going to try. We shall stand up and publicly admit our errors as long as we find them or you point them out to us.

We certainly hope the new department does not have to run "every month."

Scientists in Uniform

LATE last year the deputy director for research and development in the General Staff, U. S. Army, received a report of an extensive investigation of the use and misuse of scientists and engineers in the Armed Forces during World War II. With the cooperation of 31 scientific and engineering societies, questionnaires were mailed to approximately 135,000 members. Useful replies were received from about 70,000 of which 15,157 reported recent military experience. Those most poorly utilized technically were biologists, geologists, chemists and mathematicians, in that order. Those reporting best technical use while in uniform were psychologists, geographers, engineers and physicists, again in that order.

Of slightly more than 4,000 separate recommendations concerning future wartime utilization of scientists by the Armed Forces, 81 percent recommended improved technical assignments and supervision within the services, while 19.11 percent held that scientists should *not* serve in uniform. On the question of what organization or

procedure should be used for allocation of scientists in any future war, only 0.1 percent favored continuation of the Selective Service System of World War II. Some form of national pooling and directed assignment was favored by 60.4 percent while 31.2 percent recommended improvements in the Organized Reserve Corps program.

From this investigation the authors drew this final conclusion: "The services had no adequate mechanism for the effective use of professional scientists in the ranks." This, of course, is news to no one even remotely concerned with the problem. But for the first time the report does give us the documented, authoritative data on which improved practices and procedures can be developed by the Services if they are sincerely interested in the most effective use of science in the national defense. Likewise, the Committees of Congress concerned with improvement in the Selective Service system have here the basis for some constructive changes in the provisions and administration of the present law.

Profits Mean Jobs

THAT there is a real correlation between profits, business spending for new and increased plants, and employment has been no better illustrated than by a recent compilation of the Argus Research Corp. The comparison is really remarkable. What Argus did was to consider only what it calls "elastic employment," pointing out that there is a large, non-elastic segment of our non-agricultural employment that is necessary to maintain bare subsistence. The figure is about 23 percent of the total population and represents the non-agricultural employment in 1933, when business and the economy in general were at lowest ebb. So Argus subtracted this required employment from the total and considers the remainder "elastic" in that it will vary with the country's economic health. These are the figures:

Year	Corporate Net Profits (Billions of Dollars)	Business Capital Expenditures (Billions of Dollars)	Elastic Employment (Millions)
1948	18.6	17.7	17.1
1947	18.1	16.2	16.7
1946	12.8	12.0	14.4
1941	9.4	8.2	10.7
1939	5.0	5.2	6.0
1934	1.0	3.1	1.9
1929	8.4	9.2	9.3

Such a comparison as this again emphasizes the point that corporate profits must be high—high to maintain a supply of funds for capital expansion and an improved standard of living. But more important, they must be high to maintain the employment we need. Those talking about increased corporation taxes should take heed and not kill the goose that lays the golden eggs.

Dust This One Off, Too

ANOTHER report on atomic energy completed more than a year ago is still gathering dust in the White House. Those of us who were at Bikini—and we number some 42,000 American civilians and military personnel as well as representatives of the United Nations—have long looked forward to the report of the presidential evaluation board on which the American public was represented by three prominent civilians—Karl T. Compton, of M.I.T., Thomas F. Farrell of New York and Bradley Dewey, president of Dewey & Almy Chemical Co. and wartime director of the rubber program. Some of us will recall that the last named of these three accepted his assignment from President Truman only with the understanding that the report of the board would not be muzzled or pigeon-holed.

More than a year ago the report was sent to the White House in full expectation of immediate release and prompt distribution to the American public. Why hasn't this been done? Can it be that President Truman, of all people, regards this as a political document?

Stockpiling Knowledge

TOO OFTEN in these columns we have complained about some of our universities that have turned to more remunerative applied research at the expense of the fundamental studies which have long been their historical and logical role. That this is a dangerous trend has been generally recognized but few in industry have been willing or able to do much about it. Now comes the significant announcement that the Du Pont company has appropriated a half million dollars for an experimental program of grants-in-aid to ten American universities. Each will receive $10,000 for the 1949-50 school year. The sole purpose is to raise the present level of fundamental research, to build back our stockpile of basic knowledge "upon which the future industrial development of our country and the standard of living of the American people are so dependent."

We are pleased to see such statesmanship on the part of Du Pont and its research-minded management. It opens the way for others to join in providing support for those educational institutions that recognize their prime responsibility—and opportunity for scientific pioneering.

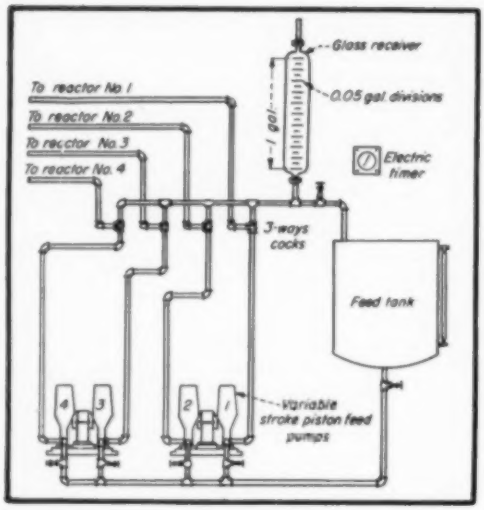
Imminent Imports

WE HAVE all known that some day imports of chemicals made abroad would be resumed to an extent that might threaten the price structure here in the United States. Most of us, however, have thought of this as rather a remote matter, largely of academic interest. Thus it is somewhat surprising to find that a very substantial importation of certain coal-tar products has already been resumed. Naphthalene imports are growing and the price has softened materially. Imported creosote products for wood preservation are selling below domestic quotations.

This is no clarion call to the rescue of the tar-products industry. It is competent to do all that is practical to meet this changing situation. But we do wish to spotlight this early evidence of renewed imports for we believe many other divisions of the process industries should take note of it. We cannot sit complacently and assume that foreign producers are unwilling to ship their products to this country for sale. In many cases they must do this in order to get much needed dollars to buy things which they want even worse than the scarce items which they send us. It is no time for alarm or panic. But it is time for thoughtful appraisal of this prospective competition.

THE PLANT NOTEBOOK

Theodore R. Olive, ASSOCIATE EDITOR



Calibrating System for Variable Stroke Piston Type Pumps

G. A. COLEMAN
The Barrett Div., Allied Chemical & Dye Corp., Philadelphia, Pa.

★December Contest Prize Winner

IN FEEDING multiple continuous reactors from a common feed tank, the problem of periodic check of feed rates is presented. Although the variable stroke piston pumps are reasonably accurate, there is some tendency to drift from setting. The change in liquid level in the feed tank represents only the summation of the feeds.

The device shown in the sketch is simple, positive, and has been used successfully by the writer. To measure flow to any reactor, the operator turns the appropriate three-way cock to divert the flow from that reactor to the measuring tube. As the liquid reaches the bottom mark on the calibrated tube the timer is started. The timer is stopped when the liquid reaches the top mark. The operator then returns the three-way cock to its original position and opens the drain valve to the right of the measuring cylinder, which drains the cylinder contents back to the feed tank. The feed rate is thus obtained in seconds per gallon which can be easily converted to gallons per minute or hour. The cylinder, valves and timer are mounted on the instrument panel for convenience.

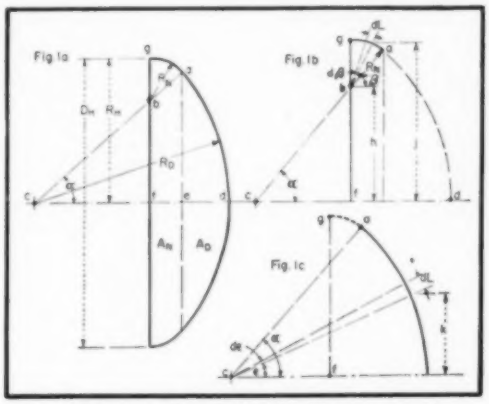


Fig. 1—Dimension diagrams for dished head area equations

Charts for Quick Computation of Areas of Dished Vessel Heads

TYLER G. HICKS
Hicks Associates, New York 31, N. Y.

FREQUENTLY during the design of tanks for chemical processes, the surface area of a dished head is required. The usual tables devoted to dished tank head properties do not contain this information. Hence it becomes necessary to compute the area. Formulas for dished head areas can

$50 CASH PRIZE FOR A GOOD IDEA!

Until further notice the editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. The winner each month will be announced in the issue of the next month: e. g., the February winner will be announced in March and his article published in April. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at our usual space rates.

Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible. Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries.

Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

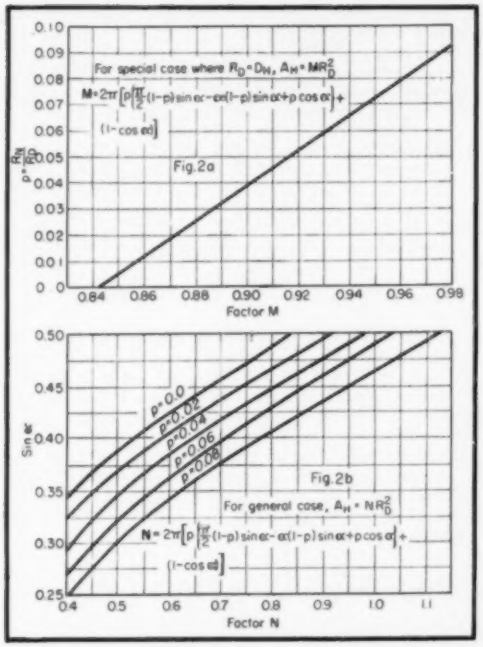


Fig. 2—Curves for finding constants for area equations.

readily be derived and then simplified by the use of charts.

For analytical purposes a dished head must be divided into two parts. Division takes place at point *a*, Fig. 1*a*, the intersection of the knuckle and dish arcs. Points *b* and c are centers for the knuckle and dish arcs, respectively. By drawing a perpendicular through a, dc is intersected at e. Then $be = R_D - R_N$, and $bf = R_H - R_N$, where R_D = dish radius, feet; and R_N = knuckle radius, feet. Then

$$\text{Sin}\,\alpha = (R_H - R_N)/(R_D - R_N) \text{ and } bf = (R_D - R_N)\sin\alpha \quad (1)$$

Using Fig. 1*b* the knuckle area, A_N sq. ft., of the head is $dA_N = 2\pi\, jdL$, but $j = h + R_N \sin\beta$, and $dL = R_N\, d\beta$, so $dA_N = 2\pi R_N\,(h + R_N \sin\beta)\, d\beta$ and

$$A_N = 2\pi R_N \int_\alpha^{\pi/2} (h + R_N \sin\beta)\, d\beta \quad (2)$$

Integrating between limits,

$$A_N = 2\pi R_N [\pi/2\,(R_D - R_N)\sin\alpha - \alpha\,(R_D - R_N)\sin\alpha + R_N\cos\alpha] \quad (3)$$

Using Fig. 1*c* the dish area, A_D sq. ft., of the head is $dA_D = 2\pi\, kdL$, but $k = R_D \sin\epsilon$, and $dL = R_D\, d\epsilon$, so $dA_D = 2\pi R_D^2 \sin\epsilon\, d\epsilon$ and

$$A_D = 2\pi R_D^2 \int_0^\alpha \sin\epsilon\, d\epsilon \quad (4)$$

Integrating between limits,

$$A_D = 2\pi R_D^2 (1 - \cos\alpha) \quad (5)$$

Adding Eqs. (3) and (5), the total area of the dished head, A_H sq. ft., is

$$A_H = 2\pi [R_N\,(\pi/2\,(R_D - R_N)\sin\alpha - \alpha\,(R_D - R_N)\sin\alpha + R_H\cos\alpha) + R_D^2\,(1 - \cos\alpha)] \quad (6)$$

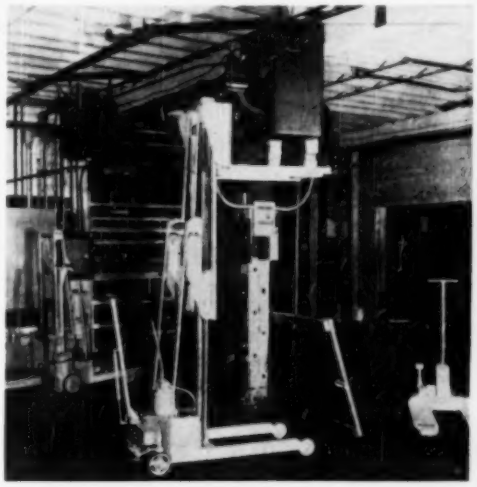
by setting $p = R_N/R_D$, or $R_N = pR_D$, then

$$A_H = 2\pi R_D^2 [p\,(\pi/2\,(1-p)\sin\alpha - \alpha\,(1-p)\sin\alpha + p\cos\alpha) + (1 - \cos\alpha)] \quad (7)$$

To simplify area calculations, the curves of Fig. 2*a* and 2*b* have been drawn. A study of Fig. 2*a* will show that it applies to the special case where $R_D = D_H$, and $A_H = MR_D^2$. The constant M is obtained from the curve for a given value of R_N/R_D. Usual values are covered by the curve.

The curves of Fig. 2*b* are suitable for the general case, and by use of them the area of any dished head can be found as $A_H = NR_D^2$. The constant N is obtained from the curves for the given value of R_N/R_D. For standard dished heads, $R_N = 3t$, where t = head thickness, inches. R_N = 6 percent of head diameter in inches for ASME Code heads.

The curves and formulas presented permit quick determination of the surface area of any dished head. Use of this method for finding head areas will reduce the time spent in design and estimating work.



Simple Method for Rigging Equipment

As THIS view suggests, the simple hydraulic lift truck with elevating platform makes a safe and convenient method for supporting various sorts of equipment during installation. Here a Lyon-Raymond truck with elevation to 108 in. is being used in the installation of a heavy unit heater, a job which usually requires a block and tackle—with something to fasten it to—or a special scaffold.

January Prize Winner

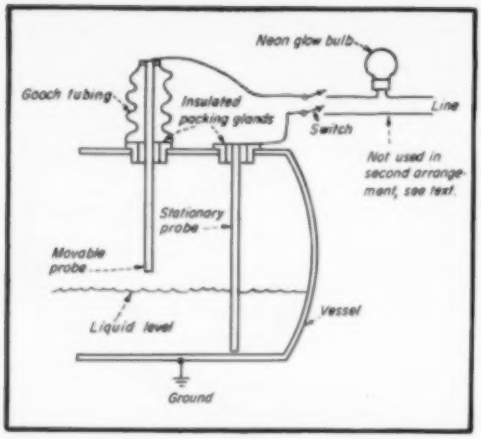
A $50 prize will be issued to

Paul Munk

Chemical Engineer, Berkeley, Calif.

For a description of a new template for flow diagrams with novel features. It fits ¼-in. paper directly, can be used for almost all equipment forms, and draws distilling column set-ups without moving the template.

This article will appear in our March issue. Watch for it and the other handy ideas in the Plant Notebook!



Simple Electrical Arrangement for Liquid Level Determination

WALTER G. THOMSON
Minnesota Mining & Manufacturing Co., St. Paul, Minn.

ACCURATE determination of liquid levels in inclosed tanks often presents quite a problem. The accompanying sketch shows one method of doing so. The test bulb is a neon glow bulb which lights at approximately 90 volts potential and can be safely used up to about 500 volts. These bulbs have a very high resistance and consequently draw very little current. This makes possible their use in applications where the liquid has a very high resistance. They can be used, for instance with 115 volts a.c. in tap water where the electrodes are as much as 18 in. apart. Of course the electrodes can be separated a much greater distance with higher potentials. Care must be taken to prevent getting the liquid on the insulation. If the liquid covers the insulation it will form a tenacious film short circuiting the electrode, and giving erroneous readings. The attached sketch shows a typical installation.

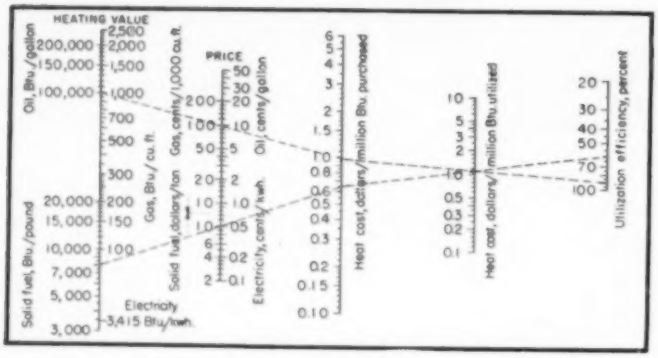
The Gooch tubing indicated in the sketch serves as an insulator for the exposed portion of the movable probe, and to prevent accidental contact. Any other suitable insulating device can be used. An alternate arrangement is to use a single probe only and a grounded container. The second lead is not used but if desired it can be attached to the vessel and the whole vessel insulated.

X-Ray Photometer Controls Gas Odorizing

CONTROL of the quantity of mercaptans added to natural gas for odorization is being accomplished by Standard Oil Co. of California through the use of a recently developed X-ray photometer made by the General Electric Co. It is also possible to control the sulphur content of the mercaptan used in the same way. Using a standard aluminum disk as a reference the device measures the X-ray absorption of the mercaptan sample by photoelectrically measuring the intensity of fluorescence of a fluorescent screen on which the X-rays impinge after passing through the sample.

Preventing Water Damage in Fires

A RECENT issue of the *Factory Mutual Record* describes a good idea employed in the plant of Davol Rubber Co., at Providence, R. I. The fire brigade has a "salvage truck" equipped with waterproof covers, sawdust, brooms and shovels, to take care of floor-to-floor leaks when a fire calls for sprinkler action or the use of a hose stream. Machinery can be covered and the water swept out, often saving a lot of trouble from wet motors.

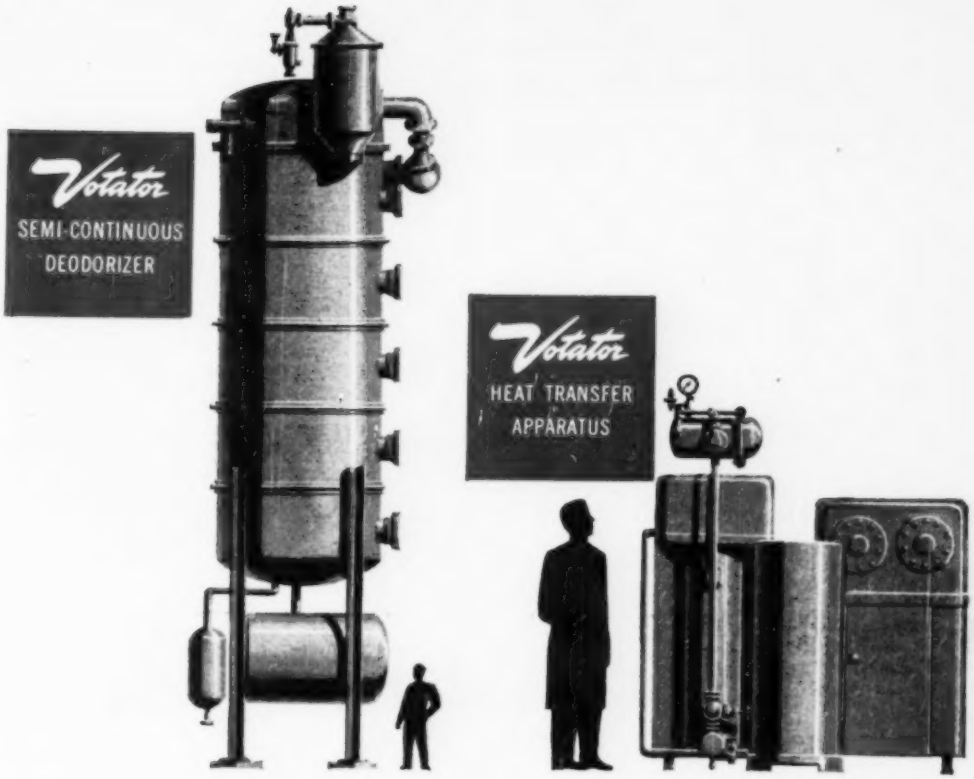


Nomograph for Determining and Comparing Heat Costs

R. V. TOMKINS
Chemical Engineer, Department of Natural Resources and Industrial Development, Regina, Sask., Canada.

WE FREQUENTLY find it necessary to compare the cost of heat from fuels of varying heating value and price; and although the calculations are simple, the quantities used as units for sale are often different from those used in measuring heat content, making bothersome conversions necessary. I constructed the accompanying nomograph which facilitates determination of heat cost in common units (dollars per million Btu.), and allows rapid comparison of fuels, taking into consideration heating value, price, and efficiency of utilization.

A line projected through the heating value and price scales gives the cost per million Btu. purchased on the center scale. By connecting this point with the utilization efficiency, the cost per million Btu. utilized is obtained on the fourth scale. The example on the nomograph determines the price which must be paid for 8,000 Btu. per lb. coal, burned at 60 percent efficiency, to supply heat at a cost per Btu. utilized equal to 1,000 Btu. per cu. ft. gas, burned at 90 percent efficiency, and available at 98c. per 1,000 cu. ft. The cost per million Btu. utilized is determined for the gas as slightly under $1.10. This value is connected to 60 percent on the utilization efficiency axis and the cost per million Btu. purchased marked on the center scale. A line drawn through this point and 8,000 on the solid fuel heating value scale intersects the price scale for solid fuels at slightly over $10 per ton, which is the desired figure.



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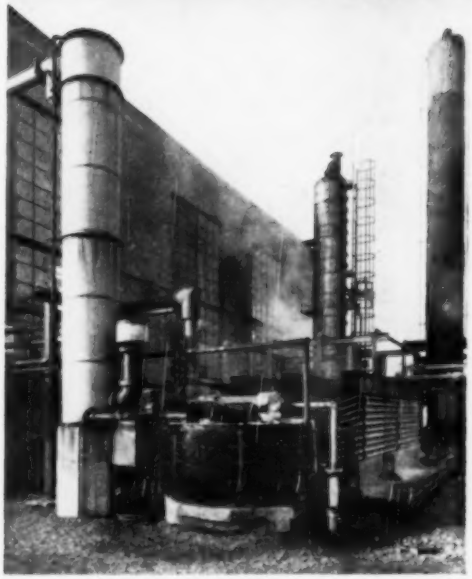
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2 Caustic tank, air filter and air scrubbing tower; cooler, secondary absorber and still are at the rear.

Formaldehyde

ARTICLE ON PAGE 150

FORMALDEHYDE for use in making phenol-formaldehyde resins is now being produced by Durez Plastics & Chemicals, Inc., at its plant in North Tonawanda, N. Y. The plant makes about 10,000 gal. or 91,000 lb. of formalin per day. This is a water solution containing about 37 weight percent of formaldehyde. The new plant for this purpose, designed and built by Chemical Construction Corp., burns a mixture of methanol vapor and air in the presence of a prepared silver catalyst material. The resulting mixture of formaldehyde and unconverted methanol is dissolved in water and the solution is distilled to recover unreacted methanol and produce finished formalin.

Methanol is received in tank cars and pumped to four 61,000-gal. storage tanks from which it is pumped to a steam heated vaporizer. Air for the process is filtered, then washed with caustic to remove sulphur compounds which would damage the catalyst. The methanol vapor at about 18 psig. mixes in carefully controlled proportions with the air which has been heated to 70 deg. C. and the mixture then flows to a burner or converter where the two reactions of oxidation and dehydrogenation of the methanol occur simultaneously at a temperature of about 635 deg. C.

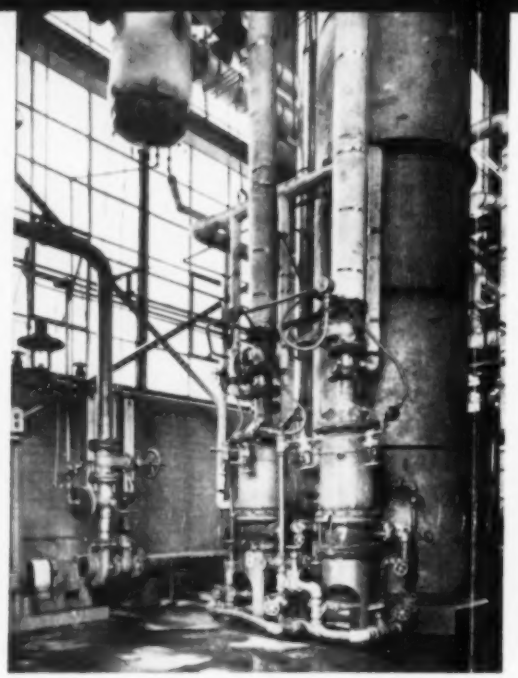
The hot mixture of gases issuing from the burner is immediately quenched in a primary absorption tower by contact with cool liquor containing 28 to 30 percent formaldehyde and 22 to 20 percent of methanol in water. A small part of this liquor flows continuously to the F-M liquor tank, while the bulk of the circulating flow is cooled in a water-cooled trombone cooler. The gases leaving the absorber pass through a Roots blower and then to a secondary absorber where the remaining formaldehyde and methanol are stripped against a flow of distilled water. The dilute solution resulting is the feed for the primary absorbers.

Last in this sequence of operations is the distillation of the F-M liquor to recover the unreacted methanol and produce a bottoms product containing the formaldehyde in water solution, with less than 1 percent of methanol. The methanol goes overhead and is condensed, most of the condensate being returned to the column as reflux. The excess is pumped back to the vaporizer and thus reenters the process. The bottoms product flows through primary and secondary coolers and thence to the two product storage tanks. Each tank as it is filled is first agitated, then analyzed and diluted to the standard strength of 37-37.5 percent formaldehyde. The solution is then agitated again and pumped through a hot-water-traced line to the resin plant.

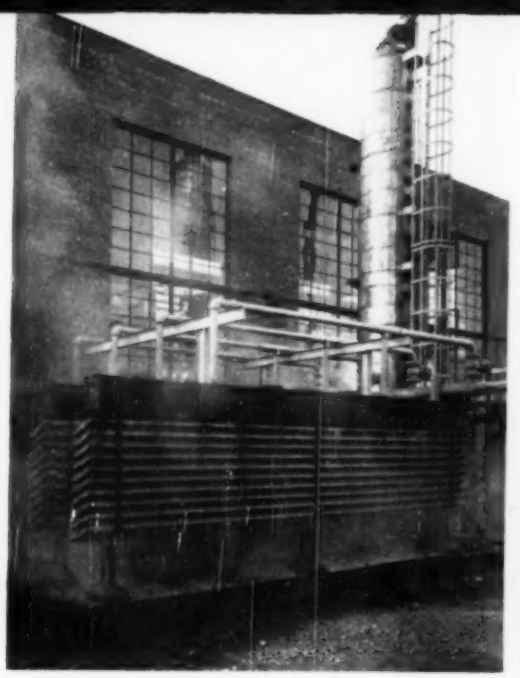
CHEMICAL ENGINEERING
February 1949
PAGES 146-149



3 In the midst of this maze of piping are the vaporizer and superheater which produce dry methanol vapor at about 18 psig.

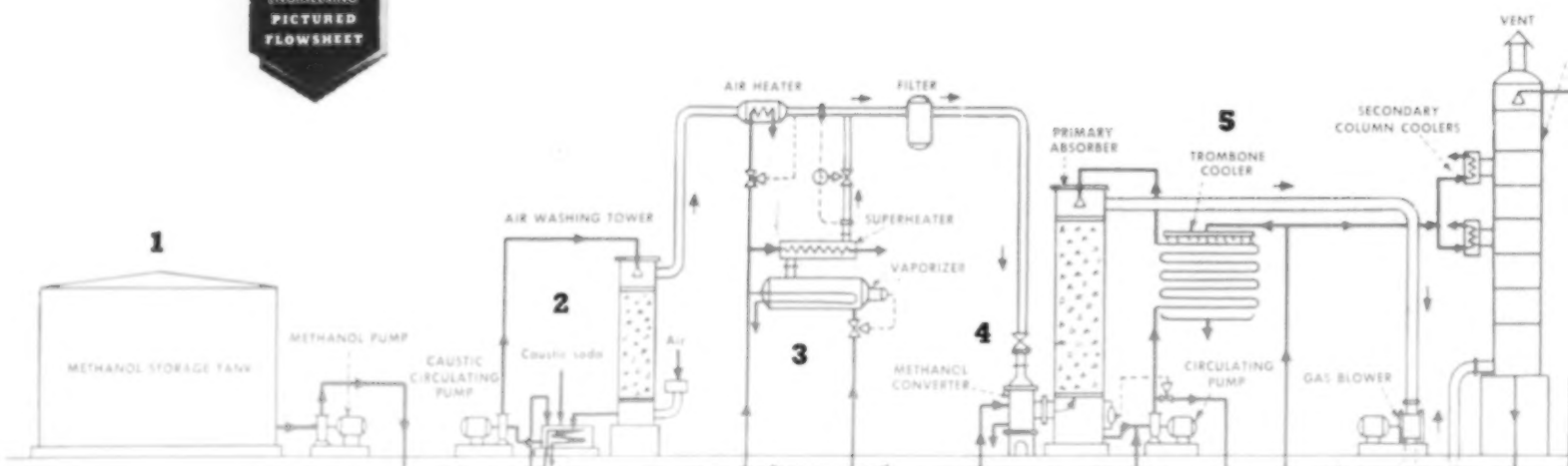


4 Here is one of the primary absorber towers; two of the three burners connected to the tower appear in the foreground.



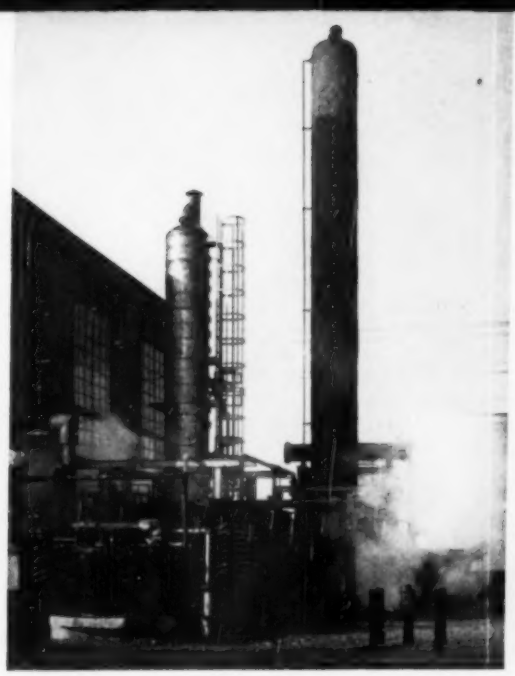
5 These water-cooled trombone-type coolers serve the primary absorbers by reducing temperature of the circulating liquor.

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

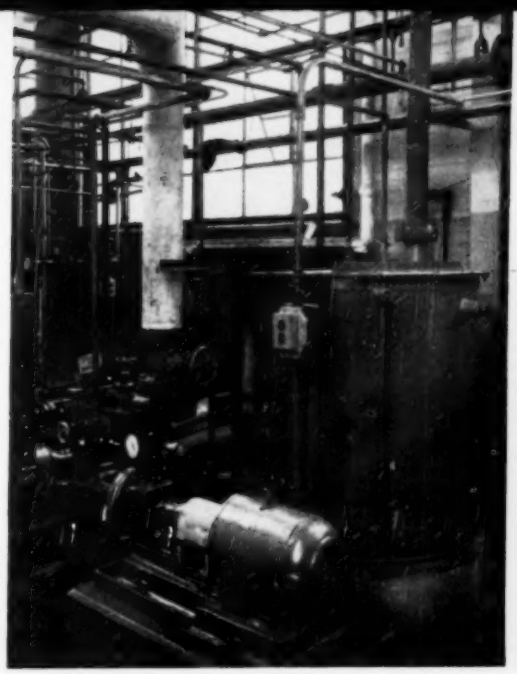




primary
liquor.



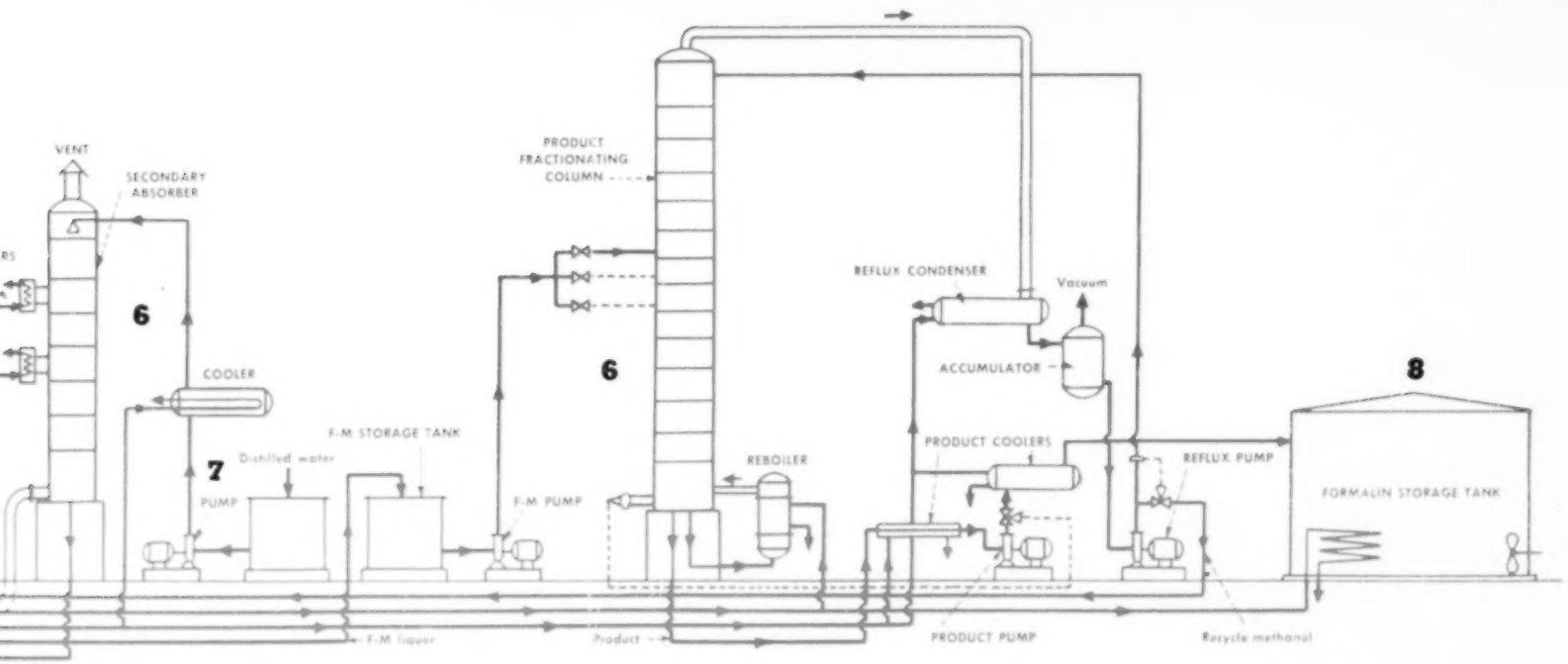
6 Behind the trombone coolers are the secondary absorber, on the left, and the product fractionating column, on the right.



7 Here are some of the many process pumps and the tank where steam condensate collects for feed to the final absorber.



8 Two storage tanks with steam coils, level gages and agitators collect the formalin made each day.



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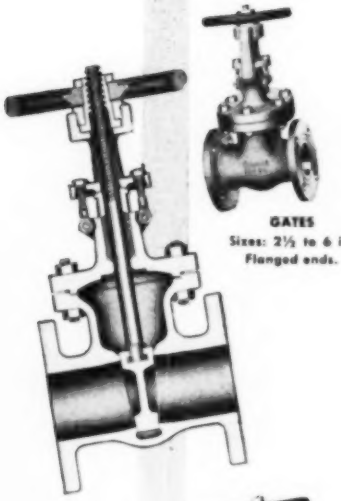
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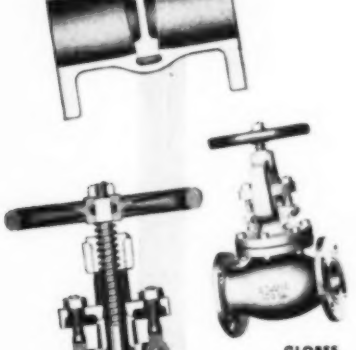
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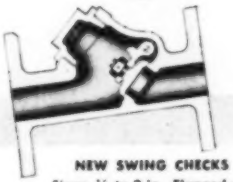
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8-8 Mo and Monel

ng Pressure: 150 pounds, liquid or gas

le in either all 18-8 Mo or all Monel, these new valves
ne Co.'s most advanced contribution toward better con-
rocessing fluids.

eloping these valves, Crane engineers have overlooked
—in materials or mechanical design—that would assure
positive performance, economical operation, and ease
enance. Rugged construction provides greater safety for
ator and contributes substantially to longer valve life,
der severe corrosive conditions.



your choice of materials. All parts in
with flow are either Crane Quality 18-8
Monel—materials produced under the
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eir class—at your local Crane Branch,
r Catalog No. 320, describing Crane
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NG CHECKS
n. Flanged or
d ends.
y flow pattern
½ to 6 in.

IN SIZES ½ to 2 IN., these new Crane Plug Gates serve as double-duty valves. Unique seating development combines best service characteristics of conventional gate and globe valves. Ideal for process and chemical industries.

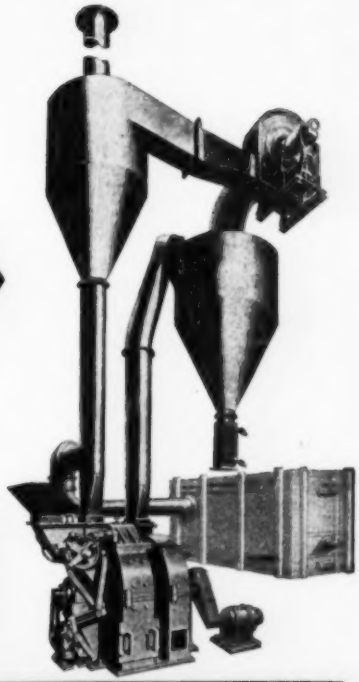


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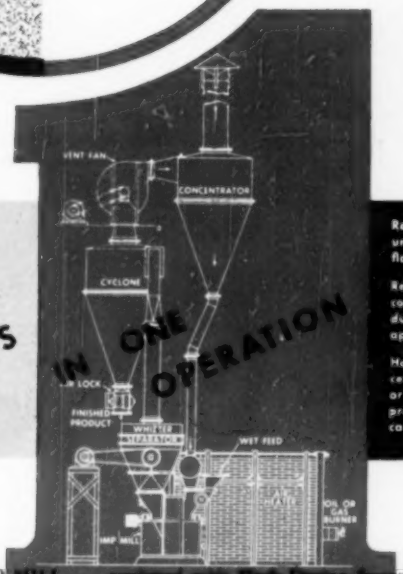
PLUMBING
AND
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FOR EVERY PIPING SYSTEM

It...
SHORTENS YOUR Production Time



DRIES
GRINDS
SEPARATES
IN ONE OPERATION



Raymond Imp. Mill shown above with furnace unit for supplying heated air to the mill for flash drying system.

Removing water of crystallization from hydrate compounds, such as copper sulphate, and producing a fine, dry, uniform powder, is a typical application.

Handling crude clays containing a high percentage of moisture, and drying to 3% content or less, while pulverizing to a fine, free-flowing product . . . this and other similar problems can be done economically by this method.

THE Raymond IMP MILL . . . equipped with Flash Drying System . . . is the modern equipment so widely used throughout the chemical industry for the manufacture of powdered materials.

It combines the drying and grinding in one machine . . . eliminating separate dryers and conveyor units. This means less time in handling the material . . . smaller space requirements . . . and easier control over the finished product.

It's a clean, dustless, automatic operation that can be applied to many different drying and pulverizing problems . . . with assurance of definitely proved economies over the former methods.

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RAYMOND PULVERIZER DIVISION
1311 North Branch Street, Chicago 22, Ill.

PROCESS EQUIPMENT NEWS

Theodore R. Olive, ASSOCIATE EDITOR



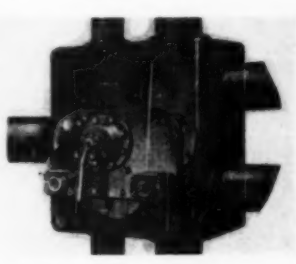
1. Novel Agitator

FOLLOWING an agreement with Dr. Bronislaw Goldman, Pittsburgh consulting engineer, the Engineering and Construction Division of Koppers Co., Pittsburgh 19, Pa., is now prepared to offer the Goldman agitator which is said to have been used extensively in Europe. As the view of the small model shows, the agitator consists of a cylindrical rotating tube with stirring paddles attached to the bottom. Above this is a stationary, freely suspended vane or baffle portion which supports a funnel-like cylindrical portion above and around the rotating cylindrical agitator. When the motor starts, the rotating paddles suck liquid down from the cylindrical tube, driving it outward and upward in a helical motion which puts pressure on the suspended baffles, causing them and the telescopic funnel portion to the lift to the top of the liquid and remain there as long as the liquid is in motion. In this position the baffles cause a cataract-like flow of liquid into the funnel and cylindrical tube, where the process repeats. Thus, it is claimed, mixing action is predominantly in a vertical direction. It is claimed that comparatively low power is required, and that there is, furthermore, a substantial reduction in mixing time which also results in substantial power savings.

2. Overload Controller

OFFERED by the Technalectric Co., 445 Folsom St., San Francisco 5, Calif., a new automatic load controller, known as the Techna Loadtrol, is now available. The device is produced in two models, a standard type consisting of a current-actuated solenoid, mercury switch and selector switch mounted in a steel case; and a somewhat similar type which also includes a current transformer and flush-mounted ammeter for visually determining the load on the connected motor. The solenoid coil is wired in series with a lead to the motor whose load is to be regulated. When the cut-out current for which the instrument has been adjusted is reached, the mercury switch is actuated to open any desired circuit.

These devices are suitable for controlling motors ranging from 5 to 150 hp., and suggested applications lie in controlling the feed to grinding mills, mixers, crushers, pellet mills and cutters, as well as to conveyors and other sorts of materials handling equipment to prevent overload. They may also be used to shut down equipment should an overload occur. They can be used to prevent motor burnouts from whatever cause, and may also be applied in cutting out unimportant loads in a plant where operation over a certain peak load serves to penalize the power customer. These controllers are available in the East from Bullock-Smith Associates, 136 Liberty St., New York 6, N. Y.



3. Softener Control Valve

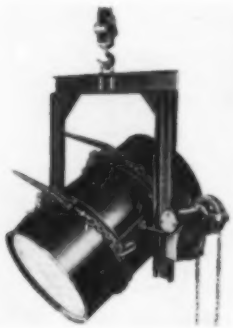
TO SIMPLIFY operation by replacing the several valves customarily used in zeolite softeners and ion exchange system with a single control valve, the Cochrane Corp., 17th and Allegheny Ave., Philadelphia 32, Pa., has developed a pilot-actuated, six-position valve which can be controlled either manually or automatically. Power for

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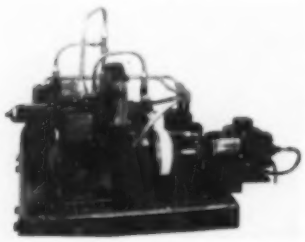
FOR MORE INFORMATION
See Reader Service
Coupon on pages 169-170

operating the pilot system of the Hydromatic valve is produced by the raw water itself. Smooth operation is said to result, with gradual motion of the valve members in passing from one sequence to the next, inherent in the construction. The valve incorporates a number of other special features, such as built-in backwash and rinse-rate controllers which reduce both the space requirements and the attention required by operating personnel.



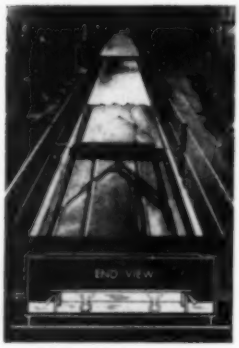
4. Drum Tilter

SAFETY locking devices are a feature of the new drum and barrel tilt now being manufactured by Palmer-Shile Co., 12606 Mansfield Ave., Detroit 27, Mich. Shown in the accompanying illustration, the device consists of a structural steel U-frame with trunnion plates and drum-locking chains, the tilt device being an inclosed worm-gear unit running in a bath of oil. The device is operated by a hand chain and can be turned through 360 deg. Designed for standard 55-gal. drums and barrels, the device has a 1,000 lb. capacity.



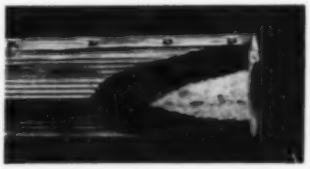
5. Tracking Controller

FOR POSITIONING the edge of any sheet-like material entering a process over rollers, the Askania Regulator Co., 240 East Ontario St., Chicago 11, Ill., is offering a new edge positioner, employing this company's jet-pipe principle of control. A pair of opposed air nozzles is positioned to pass a narrow stream of air past one edge of the sheet. The air leaving one nozzle is received by the other, which is connected to the diaphragm of a standard Askania pressure regulator. The sheet moving between the air nozzles cuts a certain amount of the flow of air to give an impulse to the controller, which is then transmitted to a cylinder so as to change the position of the sheet on the roller, either by pivoting the axle of the roller or by moving it from side to side. The position of the air nozzles can be changed by means of a hand wheel to cause the edge to track at any point with relation to the center of the roll. A model of the controller, employing a narrow band for demonstration purposes, is shown in the accompanying view.



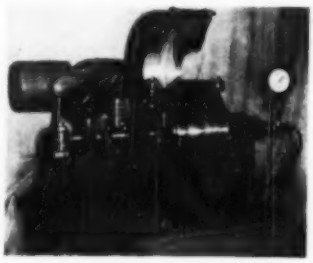
6. Water-Cooled Conveyor

USE of a flat stainless steel conveyor belt which is actually supported on water is a new development of the Conveyor Department of Sandvik Steel, Inc., 111 Eighth Ave., New York 11, N. Y. It is claimed to result in faster cooling in handling of a variety of materials, such as gelatin, pitch, synthetic resins and sodium metasilicate. The device can also be used for heating. Molten chemicals are poured on to one end of the conveyor and taken off in strip form from the opposite end. Tapered rubber strips fitted to the edges of the belt hold the liquid chemical in place. The top band of the continuous belt passes over a water bed formed by a series of tanks connected so as to form one continuous trough. These tanks are usually filled with circulating water, although other coolants can be substituted. When the unit is operating, the water pressure is just sufficient to raise the belt from its supports, with the surplus water overflowing into adjacent gutters which collect and return it for circulation. The exact design and arrangement is modified by the manufacturer to fit particular applications.



7. Weather-Tight Jacket

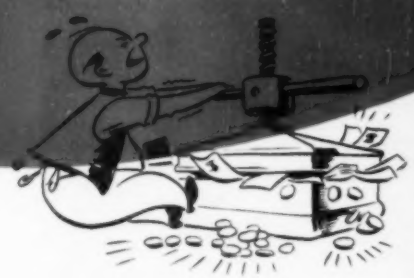
TO PROVIDE outdoor protection for insulated pipes, the Childers Mfg. Co., 625 Yale St., Houston 7, Tex., has introduced a new aluminum jacketing. This material, which is supplied in rolls 4 ft. wide by 100 ft. long, consists of a light sheet of corrugated aluminum backed up with a glued-on asphaltic moisture barrier. It is easily cut to the desired size for any diameter of pipe and applied with staples or sheet metal screws, without banding or wiring. Since the moisture barrier is attached (although it may be had without this barrier), the jacketing is applied directly over the insulation, and it is claimed that field labor is cut almost in half. The material is produced of 2S aluminum alloy, 0.0055 in. thick, fabricated with ¾ in. corrugations. The moisture barrier is a 70 lb. kraft paper impregnated with asphaltic compounds and coated on both faces with a sealing mixture of gilsonite, resins, waxes and special asphalts. It is said to be 38 times as impervious to moisture as 15-lb. asphalt felt.

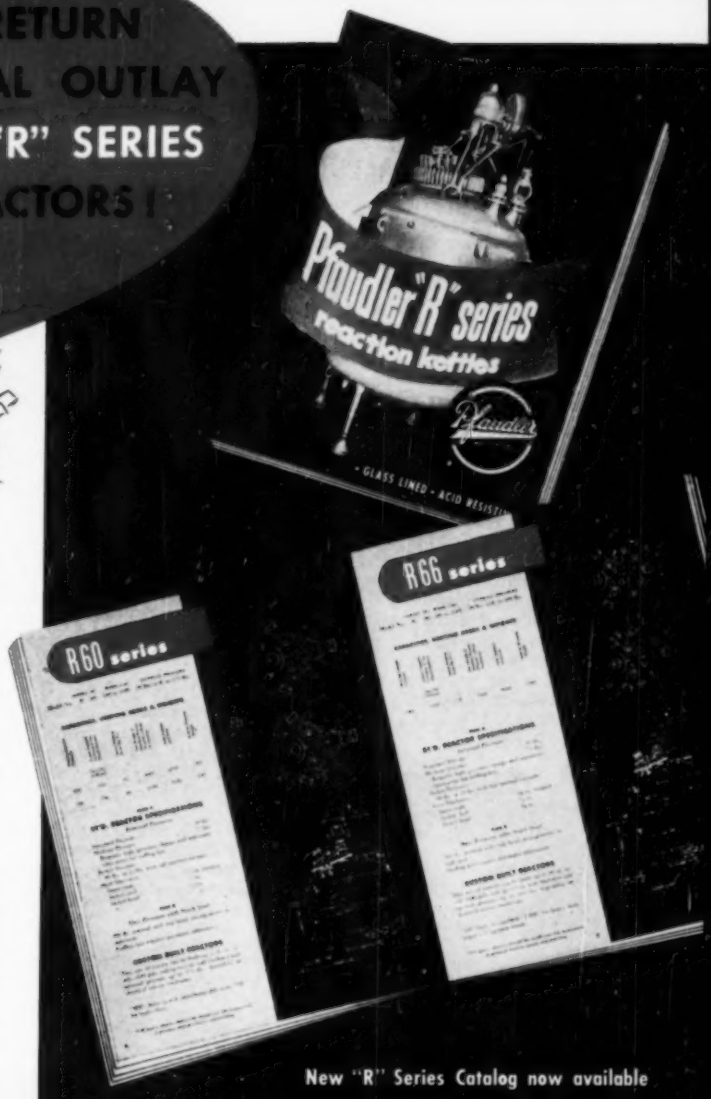


8. Pilot Plant Extractor

AFTER producing plant-scale, liquid-liquid centrifugal extractors for several years, Podbielniak, Inc., 341 East Ohio

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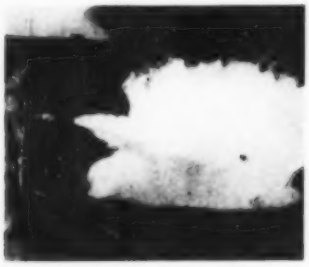
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COMPANY _____

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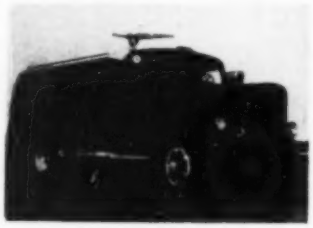
CITY _____ ZONE _____ STATE _____

St., Chicago 11, Ill., has now introduced a pilot plant model designated as No. 6100. The machine accomplishes countercurrent scrubbing or washing of one liquid with another (immiscible) liquid, and does this with a multi-stage effect. The machine consists primarily of a stainless steel rotor supported in bearings and inclosed in a housing, balanced for operation at speeds up to 5,000 rpm. The rotor is provided with liquid passages through the shafts for introducing the heavy liquid at the center of the rotor and the light liquid at its periphery. Separate passages are also provided for removing the two liquids. Within the rotor is a helical path between heavy side plates. The heavy liquid spirals outward, while the light liquid spirals inward with the phases separated by centrifugal force. Provision is made for repeated mixing and separation of the liquids, so that the single machine gives the equivalent of three or more countercurrent batch extractions. The boltless rotor is closed with Teflon gaskets and the shafts are supported on ball bearings, with liquid connections through specially designed seals. Capacity is in the range from 10 to 30 gph. for the combined light and heavy liquid streams.



9. Powder Extinguisher

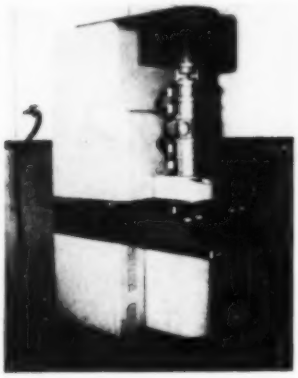
Made in 20 lb. and 30 lb. capacities, a new dry chemical powder extinguisher, offered by Walter Kidde & Co., Belleville, N. J., is suitable for use against flammable liquid and electrical fires in industrial plants, oil refineries and similar operations. The extinguisher is charged with carbon dioxide to expel the powder and, in general, is similar in appearance to, and operates similarly to other Kidde carbon dioxide portable extinguishers. Carbon dioxide is contained in a separate small cylinder mounted on the side and is released into the powder chamber when the lock pin in the handle is removed and the trigger is pulled. The powder is said to carry 20 ft. or more. If the trigger is released before all the powder has been expelled, pressure is maintained so that the extinguisher can be put into action again.



10. Dry Chemical Engine

To permit the use of large quantities of dry fire-extinguishing chemical in fighting severe flammable-liquid fires in chemical plants, the Ansul Chemical Co., Marinette, Wis., has introduced a fire truck carrying 2,800 lb. of dry chemical and 250 gal. of water. The truck, weighing 21,500 lb., can be operated at speeds up to 62 mph., or higher if the governor is removed.

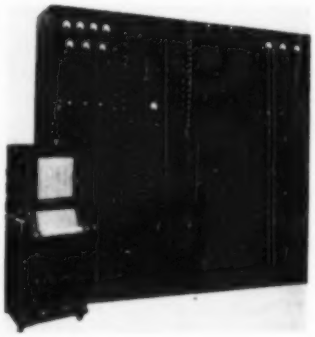
The same company has also introduced a new 2-lb., dry chemical extinguisher for use by inexperienced operators in fighting flammable liquid and electric fires. The extinguisher can be refilled on the spot after use. The fill cap is built into the mounting bracket so that the extinguisher is ready for instant use the moment it is removed from the wall.



11. Electron Diffraction Unit

After several years of experimental work on the use of electron diffraction as a tool for quick analysis of chemical substances, the Radio Corp. of America, RCA Victor Div., Camden, N. J., has announced the Model EMD-2 electron diffraction unit, which was recently exhibited for the first time. The new instrument permits chemical analysis of substances weighing as little as 1/28 millionth of an ounce and is said to provide the best known method of studying the submicroscopic surfaces of metals to uncover the action of corrosion and rust contamination.

The new unit reveals the chemical composition and atomic arrangement of crystalline substances by directing a beam of electrons through a minute specimen, thus producing defraction patterns which may be observed visually on a fluorescent plate, or from a photographic print. Since no two substances produce the same pattern, it is possible to identify an unknown substance by comparing its pattern with known patterns on file, just as fingerprints are compared in crime detection. The new machine produces patterns either by reflection or transmission. Resembling this company's universal model electron microscope, it comprises an electron gun, accelerating anode, an electromagnetic lens system for focusing the electron beam, an object chamber, and a viewing screen and built-in camera.



12. Electronic Computer

Said to be the first standard commercial electronic differential analyzer, a new device known as the Electronic Analog Computer is being offered by Reeves Instrument Corp., 215 East 91st St., New York 28, N. Y. Developed initially for the Navy's Special Devices Center, the device is now available for solving intricate industrial process and research problems. It can be used either to provide accurate dynamic solutions to simultaneous differential

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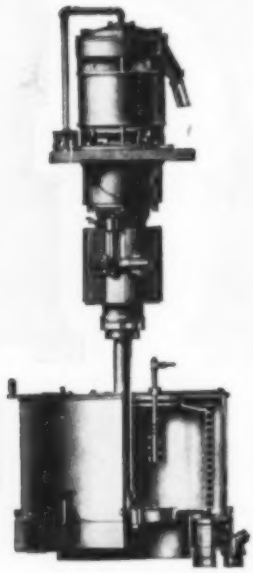
★

Uniform torque, with adjustable application.

★

Simple adjustment for accurate speed control.

★



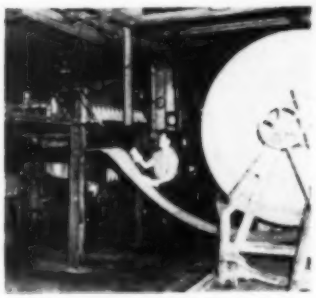
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HAMILTON, OHIO, U. S. A.

equations, or as a simulator in the design of automatic control equipment for continuous processes. To give an idea of the savings possible with this device, in a typical complex problem, the machine is said to have accomplished the desired results in 3.6 percent of the time that would have been required by trained mathematicians using hand methods, at a cost for the machine itself of only 4.4 percent of the estimated cost of hand methods.

13. Multiple Hopper Car

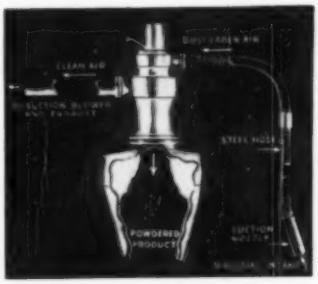
FOR SHIPMENT of granular and powdered products requiring a high degree of purity, the General American Transportation Corp., 135 South LaSalle St., Chicago, Ill., has developed a new multiple-unit hopper car to which the name of "Trans-Flo" has been given. The car, developed in collaboration with the Fuller Co., manufacturers of pneumatic conveying equipment, has 12 separate hoppers contained within a frame work of steel side and end members. The product to be shipped is loaded through double hatches at the top of each of the hoppers. The inner hatch includes a special filter device, while the outer hatch seals the opening. On arrival at the destination, the car is unloaded by an air suction device at the bottom of each hopper. The car has a capacity of 2,900 cu. ft. It incorporates means to prevent bridging and packing of the commodity, and eliminates all necessity for introducing any external means for loosening the material.



14. High-Strength Belt

FOR CONVEYING jobs where belt tensions run as high as 1,000 lb. per in. of width (which is almost double that of 48 oz. cotton fabric), the Hewitt Rubber Div., Hewitt-Robins, Inc., Buffalo 5, N. Y., has introduced the new Raynile belt which employs a combination of rayon and nylon as the strength-giving material. In addition to its high tensile strength, the belt is said to have excellent transverse flexibility, assured by the use of nylon transverse threads. The belt is claimed to have minimum stretch in actual operation, while field splicing is said to be easy because of fabric construction. The reinforcement is accomplished by use of piles of rayon and nylon fabrics suitably bonded to each other, with the top cover securely bonded to the carcass by a shock absorbing and distributing cord breaker. In construction of the belt the lengthwise cotton fibers normally used have been replaced by heavy cables of fine-strand rayon filaments, while the cotton used normally in the transverse direction has been replaced by the more flexible nylon cables.

FOR MORE INFORMATION
See Reader Service
Coupon on pages 169-170



15. Pneumatic Conveyor

DUSTLESS conveying of powdered materials at capacities ranging upward from comparatively small quantities—hitherto too small for economical pneumatic handling—is possible with a new conveyor offered by the AirBorne Conveyors Corp., 99 Warren St., New York 7, N. Y. The centrifugal separator used with this conveyor is claimed to recover fine particles much more efficiently than has heretofore been possible, this efficiency being determined largely by the percentage of extreme fines, although depending also to some extent on operating conditions. Tests on the handling of a plastic molding powder showed a loss of 6.15 weight parts in 10,000 parts conveyed. Another test in conveying commercial grinds of wheat flour containing 30 to 40 percent of particles in the 15-25 micron range showed no measurable

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UNIFORM STRUCTURE

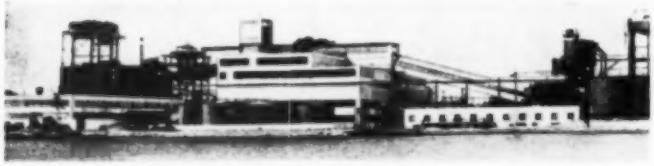
Photomicrograph (enlarged 100 times) shows even distribution of fine graphite flakes. This contributes to the uniform structure of R-P&C Electric Iron.

ACCO

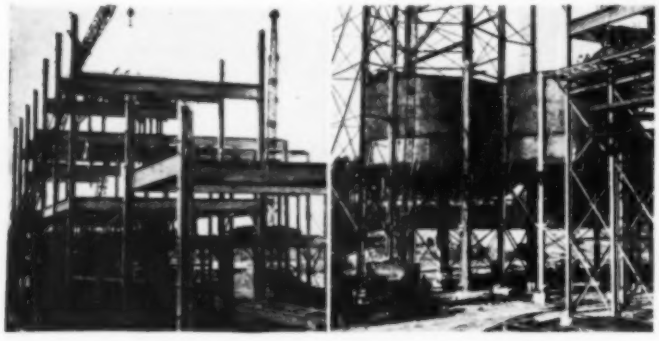
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Ingalls structural steel and platework were used in the plant of the International Minerals and Chemical Corp., Noralyn, Fla., shown in these views.



If you are planning construction of a new plant, or additions to your present one, it will pay you to figure with Ingalls first. Ingalls has had many years of experience in fabricating structural steel, vats, bins, stills and receptacles of every type for the chemical industry. The Ingalls name guarantees the steelwork to be satisfactory, economical, long-lasting; our four complete fabricating plants assure prompt service. Complete erection facilities provided, if desired. Write our Birmingham office for further information.

INGALLS STEEL

THE INGALLS IRON WORKS CO., THE INGALLS SHIPBUILDING CORP., The Steel Construction Co., Birmingham Tank Co. Fabricating plants at Birmingham and North Birmingham, Ala., Verona, Pa., and Pascagoula, Miss. Offices at BIRMINGHAM, Pittsburgh, New York and New Orleans.

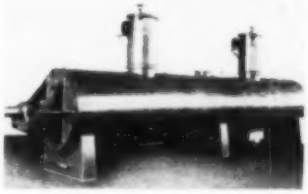


loss of material. In addition to its ability to collect fine materials, the new conveyor occupies relatively little space and headroom.



16. Bubbler Meter

To facilitate the control of flow in purge lines, Fischer & Porter Co., Hatboro, Pa., has introduced a new small bubbler type purge meter calibrated in familiar flow units, i.e., cubic feet per hour of air or gallons per hour of water. The instrument includes a built-in needle valve for close control of purge rates. The unit consists simply of a glass or stainless steel ball-shaped float in a precision-bore metering tube, supported in a die-cast body housing the needle-type control valve.



17. Rotary Vacuum Dryer

Now available in nine sizes from 1 cu. ft. to 600 cu. ft. working capacity, the rotary vacuum dryers manufactured by F. J. Stokes Machine Co., 5920 Tabor Road, Philadelphia 20, Pa., have been redesigned in many of their basic features. New spiral-type agitators are said to assure maximum mixing action and essentially complete discharge when the operating cycle is finished. Maximum contact of materials with the heating surface of the shell is accomplished by a new construction of the agitator blades. Up to 30 percent more heating surface is provided by heating not only the shell, but also both shaft and agitator arms. Other features include

Now! a permanent non-electric magnetic drum separator

Developed by *Eriez*



Magnetic drum element above can be ordered separately. Shaft diameters are standard to permit replacement in existing installations without changing bearing or shaft mountings. Ordinarily installed at discharge end of gravity flow chutes, spouts, or other conveyors.

TYPE df 101



Available in a variety of sizes, 12", 18" and 24" diameters. Utilizes a reverse feed which eliminates glancing. Adjustable check gate regulates and evenly feeds material. Shell rotates on shielded precision ball bearings, completely sealed in a dust proof mounting. Unit is fully enclosed, fully automatic and of all metal construction.

TYPE df 102



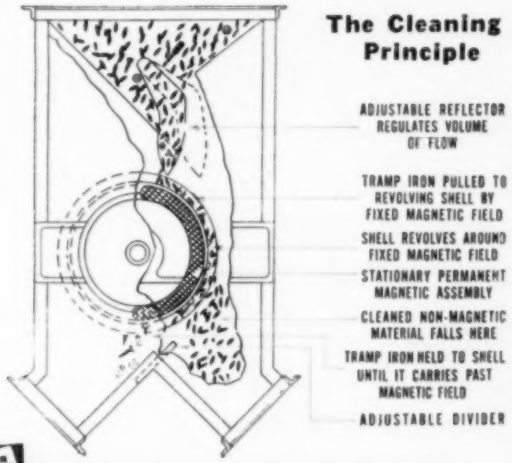
Available in 12" diameter x 14" width. Adaptable for majority of installations. Bearings are same as df 101 drum. Adjustable check gate regulates and evenly feeds material. Drum and housing are furnished ready for installation. Unit is fully enclosed, fully automatic and of all metal construction.

AFTER two years of field testing in every industry, Eriez offers industry this completely new, revolutionary magnetic drum type separator. Self-cleaning, and powered by permanent non-electric magnets, the Eriez separates ferrous materials at far lower cost. There's no operating or maintenance expense . . . no need for current or wiring . . . you get safe, spark-proof reliable magnetic protection right around the clock. There's nothing to get out of order—no attendant electrical accessories . . . the powerful magnetic field of the Eriez is Permanent and magnetic separation is amazingly simple. A look at the diagram below shows how it's done.

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Chemicals	Tobacco	Fertilizers
Grain	Explosives	Metals
Plastics	Crumb Rubber	Textiles

The Cleaning Principle



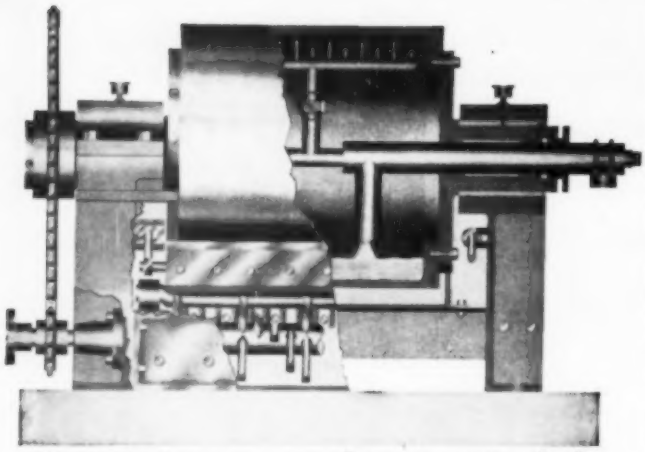
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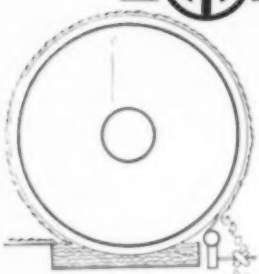
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Convert your molten materials to the finished product in *ONE OPERATION* with a

GB Flaker



The Goslin-Birmingham Flaker is used to advantage in the manufacture of acetanilide, ammonium benzoate, benzoic acid, calcium chloride, naphthalene and many other materials which are produced in molten form and solidify upon cooling.

The flaker shown above is one of the several types produced in our modern plant. G-B Flakers are manufactured to standard specifications, or to meet your specific requirements. They are available in all materials of construction, and can be provided with vapor-tight hood if required. Write for complete details.

● **Phone, wire or write for our Bulletin No. 801-C giving more complete information on Goslin-Birmingham Flakers. Engineering service and counsel are available on request. No obligation or cost.**



GOSLIN BIRMINGHAM MANUFACTURING CO., INC.

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NEW YORK: Goslin-Birmingham, 350 Madison Ave.

CHICAGO: F. M. deBeers and Associates, 20 N. Wacker

FOR MORE INFORMATION
See Reader Service
Coupon on pages 169-170

inverted refluxing type dust filters, rotary-type vacuum seals, and quick-opening discharge doors of flush-plug construction.

18. Ultra Violet Lamps

A NEW LINE of long-wave ultra violet lamps, filtered to remove all but a trace of visible light, has been put on the market by George W. Gates & Co., Franklin Square, Long Island, N. Y. These lamps are suitable for the excitation of both manufactured fluorescent pigments and materials, and natural fluorescent materials used in many industrial and professional fields. The energy peak is close to 3,600 Angstrom units, said to be most effective for activating fluorescent materials. Since the lamp produces practically no radiation shorter than 3,000 Angstrom units, it is said to have no effect on eyes or skin. These lamps are produced in sizes of 4, 6, 8, 15 and 30 watts. The necessary auxiliary equipment such as ballast, lamp starter, holders, etc., is readily obtainable or can be secured from the manufacturer.



19. High-Temperature Motors

THROUGH the use of silicone resins for winding insulation, and silicone grease for bearing lubrication, it is possible to produce a totally inclosed, non-ventilated motor in a 5-hp., 4-pole rating in the same frame sizes as an open motor of the same rating. This has been accomplished in the new all-steel, high-temperature Life-Line motor offered by Westinghouse Electric Corp., East Pittsburgh, Pa. This construction is said to permit reductions of as much as three frame sizes from the present standard Class A insulated, totally inclosed motors,



For conveying rock to the site of Bull Shoals Dam—a flood control and hydroelectric project.

Those idlers or "rollers" you see above are a vital part of the longest conveyor system in existence.

13,888 of them stretch all the way from Lee's Mountain down to Bull Shoals dam site on the White River in Arkansas, seven miles away.

Now in operation, with the conveyor belt in place, each idler shown above must support the movement of nearly ten tons of crushed rock every minute! Before the Bull Shoals Dam is completed, 4,000,000 tons of limestone will have moved over these Robins Idlers!

The engineers in charge knew that these idlers—made by Hewitt-Robins—could handle this great tonnage . . . and then some. That's because the rigid truss design of Robins Idlers is *stronger than any other type of construction!*

Moreover, they knew that seven miles of idlers, rolling day and night, must be sound in design. And Robins Idlers—with patented One-Shot Lubrication and Triple Grease Seal—*roll longer—take less care, less grease.*

This seven-mile roller coaster is only one of thousands of belt conveyors equipped with Robins Idlers.

Hewitt-Robins is the only company that is prepared to engineer, build, and install both machinery and belting *as a single unit.*

HEWITT ROBINS

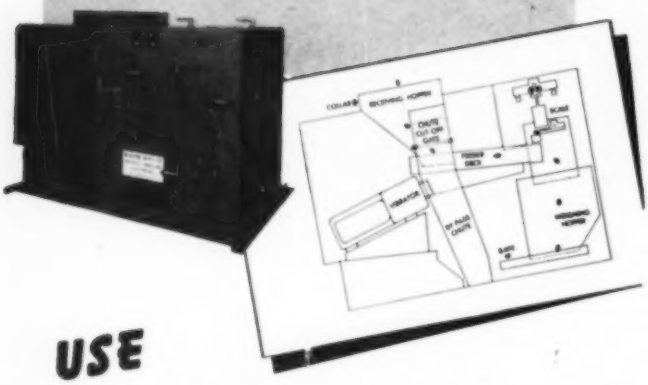
CONVEYORS

Whether you want machinery, belting, or a belt conveying system, consult Hewitt-Robins.

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Designers Manufacturers Erectors BULK MATERIAL HANDLING SYSTEM

with efficiency, power factor and torque of such a motor comparable to the similar characteristics of an open motor of the same rating. The accompanying illustration shows two 5-hp. motors, the one on the left of the new construction, that on the right of the older construction. The weight reduction is 60 percent, with very considerable reduction in dimensions.

Equipment Briefs

20. AN IMPROVED EXPANSION joint known as the Omega, has been announced by Marquette Coppersmithing Co., Christian and Water Sts., Philadelphia 47, Pa. The joint is claimed to take up pipeline movement, both axial and lateral, as well as transverse or vibratory motions. The joint avoids permanent distortion under pressure by employing corrugations of circular cross-section, so that pressure merely puts the metal under tension and the joint can be exceptionally light for any specified diameter and pressure. Sizes range from ½ in. up, for pressures from vacuum to 50,000 psi.

21. EXPLOSION-PROOF motors in the No. 736 frame size, in ratings of 200 hp. at 550 volts or less, and 150 hp., at 2,300 volts, have been announced by Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo. These motors are approved by Underwriters' Laboratories, for hazardous locations including Class I Group D, and Class II Groups E, F and G.

22. A NEW and larger model of its Payloader, designated as Model HM, has been announced by the Frank G. Hough Co., 2000 Sunnyside Ave., Libertyville, Ill. This machine features four-wheel drive, heretofore not used in this class of equipment, together with a power-boosted steering mechanism. The bucket capacity is 1¼ cu. yd. and the static loading capacity, 6,000 lb.

23. NASHUA Gummed & Coated Paper Co., Nashua, N. H., has announced a new heat-activating machine for heat-activated dry labels. Known as the Pervenactor, it is designed to be used with this company's delayed action heat-seal label paper, Pervenac. The device will handle labels up to 4 in. in width. It is manually fed and delivers labels with the adhesive side up. The labels remain tacky for several minutes, and it is claimed that two operators can label up to 1,500 containers per hour with one machine.

24. A WATER demineralizer for small flow rates, comprising a cartridge holder, a replaceable demineralizing

SHELL CHEMICAL NOW OFFERS . . .

CH_3-$(CH_2)_n$-CH_3

NORMAL PARAFFINS

OF HIGH PURITY

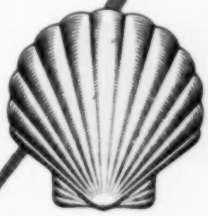
TYPICAL ANALYSES				
	C_{12}-C_{20}plus	C_{12}-C_{14}	C_{15}-C_{17}	C_{18}-C_{20}plus
Specific Grav. 20/4°C	0.774	0.760	0.773	0.778 @ 35/4°C
Color, Saybolt	Water-white	Water-white	Water-white	Water-white
Melting Range, °F	40-55	15-25	45-55	80-90
Bromine No.	0.1	0.1	0.2	0.1
Dist.: IBP	450	428	496	576
FBP	657	491	553	692
n-Paraffins, vol. %	95 plus	95 plus	95 plus	95 plus

● Normal paraffins ranging from C_9 to C_{23} are now offered by Shell Chemical for your evaluation. These products vary in physical state from water-white liquids to low-melting point solids, and are essentially free of unsaturated hydrocarbons.

Sample quantities are now available in the ranges of C_{12} to C_{20}, C_{12} to C_{14}, C_{15} to C_{17}, and C_{18} to C_{20}.

These normal paraffins are suggested as intermediates for the manufacture of detergents, plasticizers, halogenated hydrocarbons, and other products. *A letterhead request will bring samples and further technical information.*

● Among the many products marketed by Shell Chemical are Acrolein, Methyl Ethyl Ketone and Secondary Butyl Alcohol.



SHELL CHEMICAL CORPORATION

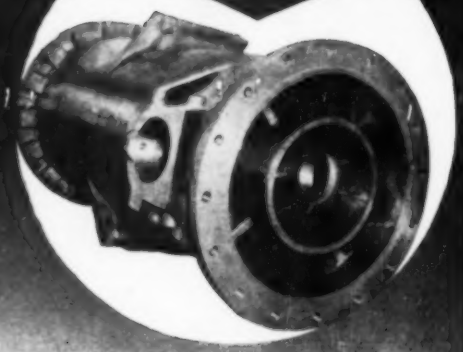
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With seven electric furnaces having a combined capacity of some 12,000 pounds of metal we're in position to turn out single static castings up to about 6 tons. Centrifugal casting machines range up to about 4½ tons in capacity. This means we can readily produce retorts, autoclave bodies, pump parts, furnace shafts, screw conveyors . . . about anything you need in the way of a casting, large or small, to resist corrosion, high temperature or abrasion.

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cartridge, and an electronic indicator for treated water quality, has been announced by A. E. Tomkin & Co., P. O. Box 7311, Washington 4, D. C. Each cartridge has a capacity to remove more than 1,100 grains of dissolved minerals. For example, about 440 gal. of New York City water can be purified before the cartridge is exhausted. The electronic indicator shows at all times the quality of outgoing water. The limit for good water, indicating that a new cartridge should be inserted, is approximately 10 ppm.

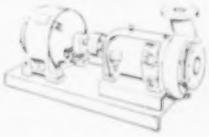
25. For the filtration of acid liquids, both inorganic and organic, the Hercules Filter Corp, Paterson, N. J., has developed a new acidproof filter press with the active heads and piping of stainless steel and the filter frames of natural or synthetic hard rubber. Various synthetic materials can also be used for this purpose. Furthermore, where necessary, the stainless steel parts can be replaced with other metals, or coated with acid-resisting synthetic materials.

26. To permit quick repairs of splits and even pin holes in pipes, gaskets, etc., the Lake Chemical Co., 607 North Western Ave., Chicago 12, Ill., has introduced Plumber Krak-Stik which is a pipe-mending cement in stick form, said to provide a positive seal against water, gas, acids, brine and other liquids. All that is required is to rub the stick heavily over any crack or leak, in pipes, vats or other liquid containers. No special preparation of the surface is required.

27. A portable laboratory-type vacuum filter, suitable for use with either cloths or cords as the filter media, has been announced by Eimco Corp., Salt Lake City, Utah. The assembly includes all necessary associated equipment, the filter being available in either drum or disk type.

28. To improve the tiering of wooden pallets, particularly when they are used to handle materials irregular in shape and size, or those subject to damage under compression, the Paltier Corp., 53 West Jackson Blvd., Chicago 5, Ill., has developed a device known as the Paltier Steel Alignment Cone. The device is a steel stanchion with a cone at the top. One is attached to each of the four corners by means of an adjustable lock nut. Similar cones are aligned with the stanchions beneath the pallets, so that when the pallets are stacked, the cones fit together and provide positive alignment, with tight enough nesting to minimize swaying, yet permit unhampered removal of the upper pallets.

THREE REASONS WHY THEY'LL GIVE YOU BETTER SERVICE . . .



❶ I-R Chemical Pumps are Armored against Corrosion with IRCAMET

These Ingersoll-Rand chemical pumps are built to stand up under the continuous handling of corrosive and abrasive liquids. All parts of the pump that come in contact with the liquid are made of **IRCAMET** — a high nickel-chromium-molybdenum alloy steel developed exclusively by I-R for chemical pump service. Laboratory tests and years of field experience have proved its exceptional ability to resist the corrosive action of a wide variety of acids and alkalis. Other materials are available for special operating conditions.

In the complete line of I-R chemical pumps, you'll find a unit that's *right* for practically any application . . . a pump that is completely engineered for maximum performance, minimum maintenance, and high operating efficiency. For complete information, write to Ingersoll-Rand, today, asking for Bulletin 7095. Or, if you have a special pumping problem, contact your nearest I-R engineer. He will be glad to help you.

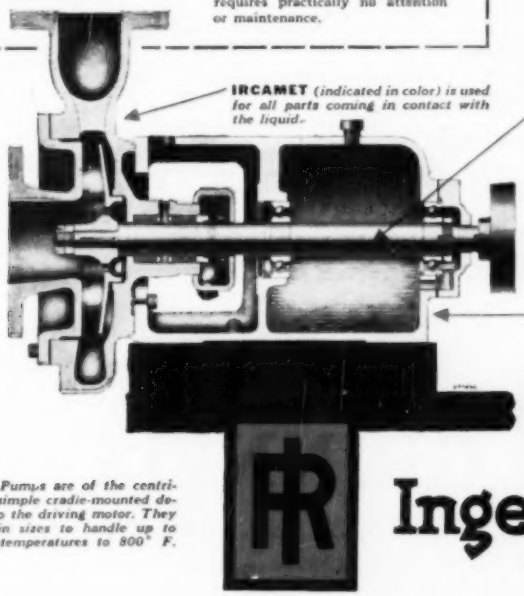
❷ They are PROTECTED AGAINST LEAKAGE —with the LEAKOLLECTOR

The patented LEAKOLLECTOR stuffing-box gland — an exclusive feature of all I-R chemical pumps — provides a simple and effective solution to the problem of pump leakage. It completely encircles the stuffing box, trapping all leakage so that it can be drained away for collection or disposal. The split gland is accurately fitted to both the inside and outside of the box, and will catch any seepage escaping between the shaft and packing, or between the packing and the bore of the box. The LEAKOLLECTOR is easily removed from the shaft for repacking the box.

❸ They are BUILT FOR EASY MAINTENANCE —and LESS OF IT

These pumps are ruggedly constructed to last longer on the job — and the simple design, with all parts easily accessible, means less "time out" for maintenance. The short, rigid stainless-steel shaft prevents impeller whip and eliminates many stuffing box troubles. The suction nozzle is removable, permitting access to the impeller without disturbing the discharge piping.

The CAMERON SHAFT SEAL can be installed on all I-R chemical pumps to replace the conventional stuffing-box packing. It eliminates stuffing-box leakage and requires practically no attention or maintenance.



IRCAMET *(indicated in color) is used for all parts coming in contact with the liquid.*

STAINLESS STEEL SHAFT *provides maximum strength, plus high corrosion resistance.*

PANOFLAM, *a modified, synthetic, resin-base paint, highly resistant to chemical action and to oil and grease, forms a protective coating over the entire unit.*

I-R Chemical Pumps are of the centrifugal type, of simple cradle-mounted design, coupled to the driving motor. They are available in sizes to handle up to 4000 gpm at temperatures to 800° F.

Ingersoll-Rand

CAMERON PUMP DIVISION 342-10
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A GRINNELL-SAUNDERS DIAPHRAGM VALVE works on a simple principle . . . it pinches tight for positive closure and opens wide for streamlined flow. The working parts of the valve are completely isolated from the fluid . . . no corrosion, no contamination and no leaks. Choice of diaphragm material. Body materials . . . cast iron, malleable iron, bronze, aluminum, stainless steel. Body linings . . . glass, lead, rubber or synthetics.

NO METAL-TO-METAL SEAT . . . The large contact area on which this flexible diaphragm seats gives positive closure even when grit, scale or other solid matter is temporarily trapped.

MINIMUM RESISTANCE TO FLOW . . . Smooth streamlined fluid passage without pockets prevents accumulation of sludge and reduces friction resistance to a minimum.

MAINTENANCE REDUCED . . . The diaphragm is the only part that normally wears out. Replaced in a few minutes without removing valve from line.

Available in various combinations of valve bodies and operating mechanisms.



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MANUFACTURERS' PUBLICATIONS

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101. Emulsifiers. Atlas Powder Co., Wilmington, Del.—75-page booklet entitled "Surface Active Agents" gives the properties and applications of the various emulsifiers produced by this company. A large part of the booklet discusses a simplified method for selecting the proper emulsifier for a particular job.

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simplified method for selecting the proper emulsifier for a particular job.

102. Tachometers. J. G. Biddle Co., Philadelphia, Pa.—28-page bulletin No. 35 illustrates the various types of tachometers produced by this company. The three types illustrated are the monometric, the centrifugal and the resonant reed types. The instruments range up to 100,000 rpm. and are available in single and multi-range types.

103. Ion Exchange. Dearborn Chemical Co., Chicago, Ill.—18-page bulletin describes the various types of deionizing equipment produced by this company. In addition to the more standard types of ion exchange units, a silica removal unit is also shown. This unit contains a highly basic anion exchange resin, which will remove silica by direct adsorption. General information is also given on the cost of operating these units.

104. Steel Analysis Chart. Globe Steel Tube Co., Milwaukee, Wis.—8-page bulletin No. 301 is an analysis chart of the various types of corrosion and heat-resistant steel produced by different companies. The trade name, type number, and complete analysis are shown.

105. Welding Fittings. Tri-Clover Machine Co., Kenosha, Wis.—16-page catalog No. 748 illustrates the various types of welding fittings produced by this company. The items shown are all of stainless steel and include such things as elbows, crosses, tees and reducers. Complete dimensions of the various fittings are shown.

106. Crushers. Allis-Chalmers Co., Milwaukee, Wis.—4-page bulletin No. 07B6006E describes the gyratory crushers produced by this company. Dimensions and crushing capacities for various sizes of units are given.

107. Pentaerythritol. Heyden Chemical Corp., New York, N. Y.—This illustrated brochure gives technical data on Pentek, the technical grade of pentaerythritol produced by this company. The brochure is particularly aimed for producers of paints, varnishes, lacquers and related products.

108. Instruments. Leeds & Northrup Co., Philadelphia, Pa.—32-page catalog No. MD44(1) catalogs the complete line of Micromax recorders and controllers produced by this company. The proper choice instrument is given for controlling such things as temperature, gas analysis, specific gravity, electrolytic conductivity and pH.

109. Polystyrene. Rohm & Haas Co., Philadelphia, Pa.—This new 13-page booklet describes the properties and methods of handling Plexene M, the new modified polystyrene produced by this company. The material is claimed to have excellent resistance to heat, chemicals and outdoor exposure.

110. Mechanical Seals. Worthington Pump & Machinery Corp., Harrison, N. J. —4-page bulletin No. W-350-B10 illustrates the mechanical seals which have been developed for corrosion-resistant chemical pumps made of Worthite. These seals are available for pumps up to 1,200 gpm. capacity.

111. Chemical Catalog. Stauffer Chemical Co., New York, N. Y.—108-page catalog lists all the chemicals produced by this company. Information included covers properties, grades, analyses, principal uses, containers, shipping regulations and other information on each chemical.

112. Disk Filter. Ertel Engineering Corp., Kingston, N. Y.—4-page brochure describes the positive seal, cylinder type disk filters produced by this company. The unit is made of stainless steel and is built in sizes to contain from 4 to 36 filter disks.

113. Heat Exchanger. Griscom-Russell Co., New York, N. Y.—32-page bulletin No. 916 describes the various types of

(Continued on page 324)

These are good for items in this issue only and must be returned by April 30, 1949

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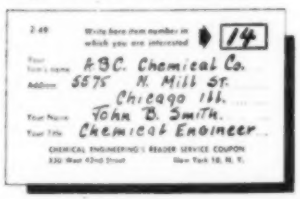
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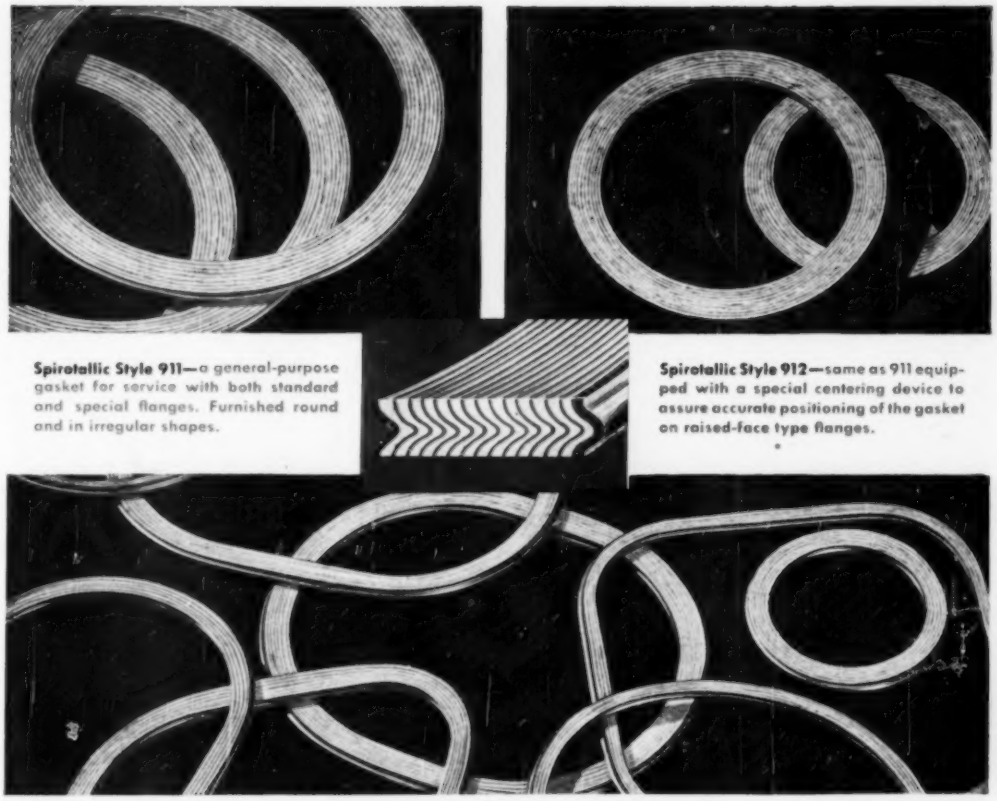
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Spirotallics owe their unique sealing action to their special construction consisting of a preformed corrugated metal strip cushioned with an asbestos filler *spirally wound*.

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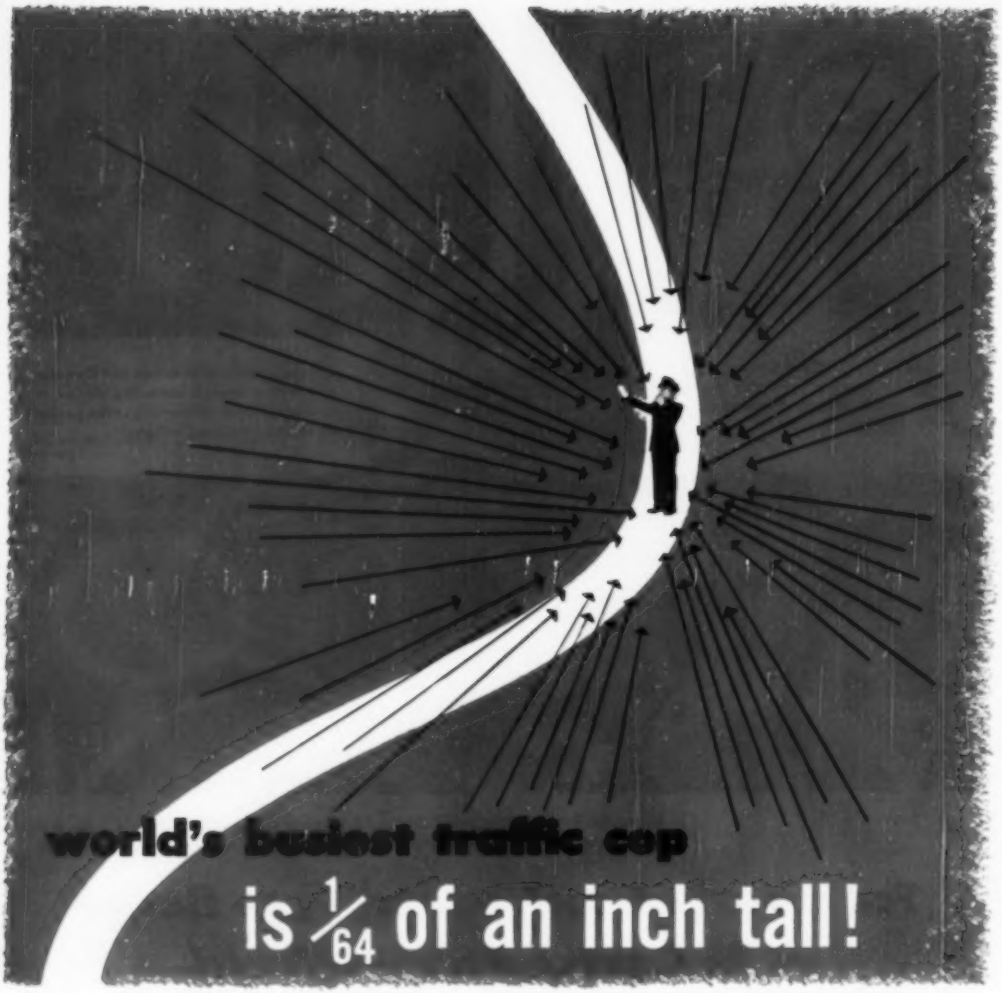
Spirotallics are furnished as general purpose gaskets for standard or special flanges and as boiler, manhole, and tube cap gaskets.

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That thin band of paint running down the middle of the highway is the world's busiest traffic cop. It talks to motorists night and day, telling them when to stay on their own side of the road and when they may pass other cars. It saves lives, keeps traffic orderly on America's most heavily travelled highways.

To do its job right, it must cover asphalt perfectly, without "bleeding," so that it can be seen clearly at all times; it must not yellow or darken under sunlight, or wash away in rain, snow or sleet; it must dry rapidly without leaving tracks from speeding tires. Above all, it must be able to stand up under the grinding punishment of 50-ton trucks and trailers month after month without cracking or wearing away.

CSC butanol, butyl acetate and dibutyl phthalate help make America's highway markers the toughest as well as the busiest traffic cops in the world. In lacquer formulations these CSC solvents and plasticizers produce the smoother, tougher, easier-to-apply finishes that reflect your products' quality.

If you manufacture lacquers, we suggest that you re-evaluate your lacquer formulas and see what CSC butanol, butyl acetate and dibutyl phthalate are doing or can do for you.

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COMMERCIAL SOLVENTS CORPORATION

17 East 42nd Street, New York 17, N. Y.

NEW PRODUCTS AND MATERIALS

Joseph A. O'Connor, ASSISTANT EDITOR



51. Sodium Pentachlorophenate

WATER-SOLUBLE sodium pentachlorophenate, trade-named Dowicide G, is now available in hard pellets comparatively free from dust. This germicide and fungicide developed by the Dow Chemical Co. is used in industry to control microorganisms.

Dow engineers made this purely physical change from flake to pellet to control the dust and facilitate handling the salt during its application to industrial and agricultural products. The small cylindrical pellets are compressed to one-fourth the volume of the original flake.

Dowicide G has been used in the adhesives, paint, leather, lumber, petroleum, pulp and paper, textile and disinfectant industries. In recent years it has also been employed in agriculture as a germicide and fungicide, to prevent losses caused by mold and bacteria.

Dow will pack the new pellets in 200-lb. Leverpak fiber drums, and the drums will be marked "pellets" to distinguish them from the flakes.

52. Nitrogen-15

NITROGEN-15 in the form of either nitric acid or potassium nitrate is now being supplied by the Eastman Kodak Co. of Rochester. The company has been supplying nitrogen-15 in the form of ammonium salts and as potassium phthalamide in concentrations up to 60 atom percent N^{15}. The ammonium nitrate has N^{15} only in the ammonium radical, not in the nitrate.

The nitric acid will be furnished as an aqueous solution containing at least two moles of HNO_3 per liter. The potassium nitrate will be sold as a dry solid.

In agricultural research, chemical scientists often desire to follow the course of nitrate in plants, it being one of the chief forms of fertilizer nitrogen. Some research workers have prepared nitrates from Kodak ammonia, usually by biological oxidation, but, in general, the process has been time-consuming. The new compounds will reduce the number of steps involved. They may prove useful also in the study of explosives and in the synthesis of organic nitro compounds and their derivatives.

53. Chemical Sealant

A NEW chemical sealant, Sealant P.E. No. 1, is now available for economically salvaging castings rejected for porosity. Small castings are impregnated by a vacuum-pressure method, employing a 29-in. vacuum and at least 100 psi. pressure. Large castings are sealed by an internal pressure method. The sealant is forced into every pore in the casting and the part is then cured by heat. The material is available for use in foundries, or the material and service is offered by the maker, Western Sealant Co. of Culver City, Calif.

54. Girard's Reagents

LONG hard to get, Girard's reagents are again obtainable in the U.S. Responding to the demand of the medical, biological and pharmaceutical laboratories, Arapahoe Chemicals, Inc., of Boulder, Colo., has now started their manufacture. Much important hormone research has been endangered due to the lack of these reagents, trimethylacethydrazide ammonium chloride (known as "T" reagent) and acethydrazidepyridinium chloride (known as "P" reagent). Both are used primarily for the isolation of such ketosteroids as estrone and androsterone from biological sources.

These compounds are not only useful for analytical studies of hormones, but also for commercial-scale isolation. Moreover, they find use in the isolation from natural sources of other ketonic materials of interest in biology, chemistry and perfumery. Arapahoe announces that both reagents are now available from stock in multi-kilo lots and that any size orders can be filled on short notice. A technical bulletin, No. 301, can be secured from the manufacturer.

55. Rare Earth Elements

CHEMICAL elements of atomic number 57 to 71, lanthanum to lutecium, are now being separated and marketed commercially by Research Chemicals, Inc., of Burbank, Calif. Salts of cerium, No. 58, have been available for

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Coupon on pages 169-170

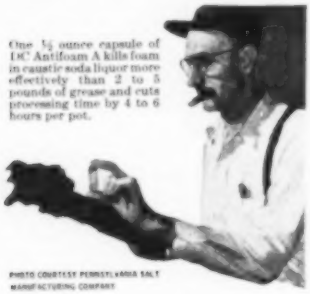
Silicone News

DC

DC Antifoam A Kills Foam in Caustic Liquors

Foam is a particularly troublesome problem at the Wyandotte, Michigan, plant of Penn Salt. In making flake caustic soda, Pennsylvania Salt boils concentrated caustic liquors in large 20 ton pots. The process is relatively easy to control until temperatures reach 260° to 280°C. At those temperatures foam begins to form in large quantities.

Before using DC Antifoam A, Pennsylvania



One ½ ounce capsule of DC Antifoam A kills foam in caustic soda liquor more effectively than 2 to 5 pounds of grease and cuts processing time by 4 to 6 hours per pot.

PHOTO COURTESY PENNSYLVANIA SALT MANUFACTURING COMPANY

Salt added 2 to 5 pounds of petroleum cup grease to each pot. This decreased the foaming but the grease "flashed" and smoked, making it hard for the operator to determine whether the foam was actually under control.

By adding 1 part DC Antifoam A to a million parts of caustic liquor, however, Pennsylvania Salt has completely eliminated foam and potential overflows. When foam first appears, a capsule containing half an ounce of DC Antifoam A is thrown into the pot. All foam is immediately downed and the process continues with temperatures rising to 320° C. Processing time is shortened by 4 to 6 hours per pot. And the cost of the DC Antifoam A required is no greater than the cost of the cup grease.

DC Antifoam A is generally effective in concentrations ranging from 1 to 5000 parts per million in a wide variety of aqueous and non-aqueous systems. For more information about DC Antifoam A, call our nearest branch office, or write for pamphlet No. 85-CD.

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some time, but until now little has been done with separations of the other elements.

Oxides of lanthanum, neodymium, samarium and gadolinium can now be had in any desired degree of purity. Work is also under way on the isolation of some of the less common rare earth oxides of europium terbium, dysprosium, holmium and erbium. After separation, the oxides are checked spectrographically and spectrophotometrically. Purities of 99.9 percent have been attained.

56. Anti-Rheumatic

NEW ANTI-RHEUMATIC just announced by A. H. Robins Co., Inc., of Richmond, is Pabalate. The drug combines para-aminobenzoic acid and sodium salicylate coated to prevent gastric irritation. This combination, even on a lower salicylate dosage, results in higher and adequate salicylate titer. Since lower salicylate dosage is possible, there is a proportionate reduction in the risk of salicylism. The two active anti-rheumatic agents act synergistically. The new drug holds promise for the therapy of rheumatic diseases.

57. Primer for Metal

NO LONGER need all rust be removed from the surface of a metal nor need the metal be perfectly dry before painting. Rust-O-Primer, developed by the Wilbur & Williams Co. of Boston, now provides a combination chemical pretreatment and primer for metal. It is a vinyl-base, quick-drying, wet primer, applicable over wet or dry, clean or rusted metal, including steel, aluminum or galvanizing. Its purpose is to provide a hard, paintable foundation for any type of paints, including ship-bottom paints as well as acid-caustic bond vinyl-type of finish.

58. Accelerator-Retarder Combination

REINFORCING furnace blacks are replacing channel blacks in natural rubber tire tread formulations. There is an increasing trend in industry toward use of these blacks in natural rubber tread formulations. These improved blacks offer better processing properties, a new concept of carbon structure and a potential economic advantage. A major difficulty in their use has been the tendency to cause scorching during processing of rubber compounds because of their high pH values combined with low accelerator adsorption

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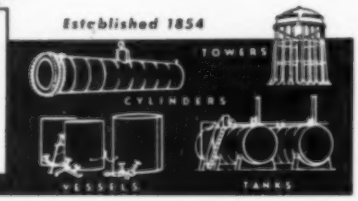
• Cole has specialized in the design, fabrication, and erection of elevated tanks for four generations. This long experience enables us to handle your assignment with dispatch, and to your complete satisfaction.

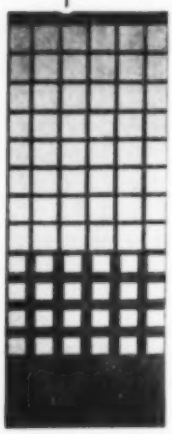
Cole builds tanks, towers, vessels, cylinders, bins, etc., to your specifications—any size, any shape, any metal. Send us your inquiries. Write for catalog—"Tank Talk."

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Hendrick makes screens to specifications for all kinds of screening processes. The illustration shows a typical example—a flux screen made for a well known chemical company. Note the two different sizes of perforations in the same plate. Hendrick has made these screens with perforations ranging from 5" x 5" to 7½" x 7".

Write us regarding your screening requirements and we will gladly give you the benefit of our seventy-odd years of screen-making experience.

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Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring
"Shur-Site" Treads and Armorgrids

properties. To solve this scorching problem, the B. F. Goodrich Chemical Co. of Cleveland has made an intensive study of a number of rubber chemicals in its development laboratories. Results to date have been very favorable with two rubber chemicals which are marketed by the company under the trade name Good-rite Erie and Good-rite Vultrol. These compounds have been successfully combined under test conditions in a tread formulation in which adequate freedom from scorch has been achieved and the inherent advantages of the reinforced furnace black realized without detriment to other important compound properties.

In the laboratory, comparisons have been made between a reinforcing furnace black vulcanizate and various similarly loaded E.P.C. black control compounds. Results proved that the R.F. black compounds are equal to, and in many ways superior to, the latter. The improved flex life and high abrasion resistance imparted by the R.F. blacks can now be utilized to advantage by use of Good-rite Erie and Good-rite Vultrol, without sacrificing hysteresis or compression-set properties. These latter properties are inferior when inadequate acceleration is used in order to obtain satisfactory processing characteristics with other accelerators or accelerator-retarder combinations.

Good-rite Erie is an excellent delayed-action accelerator for nearly all compounds of natural rubber, GR-S, and natural rubber-GR-S mixtures, including compounds containing reclaimed rubber. It has good stability, permits processing of compounds with freedom from scorch, and develops excellent low hysteresis properties with good flex resistance in properly balanced compounds. Good-rite Vultrol is a very effective retarder at processing temperatures, displaying no detrimental effect on rate of cure or properties of the cured compounds at normal curing temperatures.

59. "Upside Down" Copolymer

An original development of the Union Bay State Chemical Co. of Cambridge, Mass., Isopol is a hydrocarbon resin with moderately high molecular weight, made up of about 75 parts styrene and 25 parts isoprene, exactly the opposite proportions to those usually found in synthetic rubber. In addition to this interesting "upside down" relationship with synthetic rubber, Isopol resin seems to have definite advantages in applications where ester gum, paracoumarone-indene and terpine resins are now used.

Now in pilot-plant production,



100,000 Hours

FROM ONE SET OF "SUPER-7" V-BELTS!

OVER 14 YEARS AGO, 66 complete *Texrope* drives were installed in New York's famous RCA building . . . on air-conditioning equipment for the NBC radio studios. Today, some of these *original* V-belts are still running, 20 hours a day, week in, week out!

Texrope drives were selected for two major reasons: First, they are completely noiseless and tend to dampen vibration of other parts. Second, multiple belts offer a greater safety factor, assuring service continuity. Now, after 14 years, a "bonus" of exceptionally long life has been added.

Records like this are one reason why more *Texrope* industrial V-belt drives have been installed since 1925 — when Allis-Chalmers originated the multiple V-belt drive — than any other kind.

Texrope drives offer you the widest selection of V-belt products in industry . . . V-belts, standard, adjustable and variable-speed sheaves, and speed changers.

Send for Pre-engineered Drive Manual — Lists stock components to cover 90% of V-belt drives. See your A-C dealer or District Office, or write direct for bulletin 20B6956. Also in Sweet's.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A 2614

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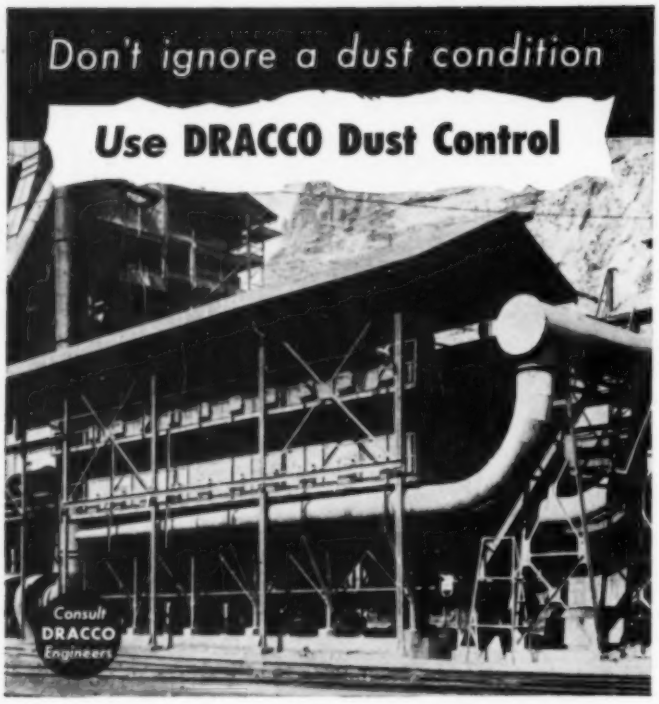
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TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.





PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.



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DUST CONTROL EQUIPMENT

PNEUMATIC CONVEYORS • METAL FABRICATION

FOR MORE INFORMATION
See Reader Service Coupon on pages 169-170

Isopol resin is clear, hard, nearly water-white in appearance, possesses many chemical properties of rubber, and is unique in that it is completely soluble in petroleum naphtha. It is a modified polystyrene in which the isoprene acts as an internal plasticizer. While such advantages of polystyrene as inertness, cost and color have been retained, the disadvantage of brittleness has been partially eliminated.

Isopol resin may be used in a solution, in an emulsion, or as a solid. At present it is available only in solid form, but it may be offered in other forms if enough demand develops.

Isopol resin is being molded at present into "window glass" which is required to break without giving sharp edges during the production of movies. The "window glass" is prepared by casting the resin into sheets, no plasticizer being necessary. For this Hollywood application, the resin had to possess the following distinctive properties: clarity, no color, sufficiently low melting point to permit easy casting yet high enough to prevent sagging in the presence of studio heat, complete freedom from cracking or crazing, heat stability during casting and sufficient strength to be handled in sheets.

Another promising use for Isopol resin is as a base in chewing gum. Here the resin in solid form is blended hot with suitable materials to give it plasticity and flavor. This use points up the extremely rubbery nature of the resin, which actually may be thought of as a stiffened rubber as well as a softened resin. Complete lack of odor and color are, of course, necessary to permit consideration of the resin for use in chewing gum.

A third possibility for the use of Isopol resin in its solid state is as a stiffener for rubber, both natural and synthetic. Closely related to rubber in its chemical structure, the resin can be milled and cured. Tests are being conducted along these lines.

A final possible use for solid Isopol resin is as an ingredient in hot melt coatings. Here the colorless, odorless and chemically inert characteristics of the resin should prove valuable. The major limiting factor in tests is that the resin tends to be slightly tacky and presents a blocking problem.

Since Isopol resin is readily soluble in low cost naphthas, as well as aro-

CELANESE* ACETIC ACID

$$CH_3-\overset{\overset{O}{\|}}{C}-OH$$

Celanese* Glacial Acetic Acid, with a purity greater than 99.5%, is now being made available to a much greater portion of American industry. The high quality of this chemical makes it ideally suited for applications in pharmaceuticals, textile treatment and in organic syntheses. This versatile acid is also used in the production of acetate esters for the varnish and lacquer industries.

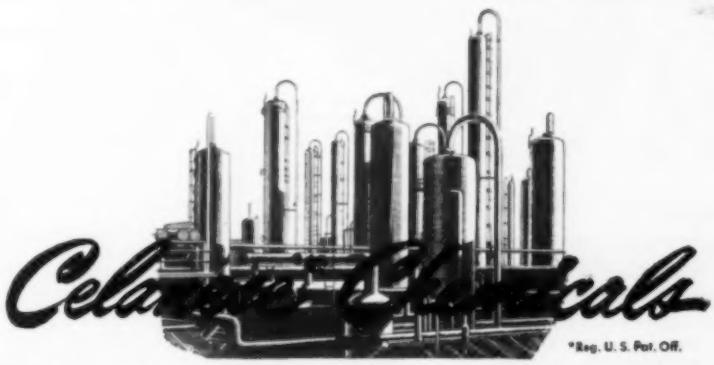
Water Content	0.5% by weight, maximum
Freezing Point	15.6° C., minimum
Specific Gravity	1.050 to 1.055 @ 20/20° C.
Color	Water White
Formic Acid Content	0.2% by weight, maximum
Non-Volatile Matter	0.001% by weight, maximum
Iron Content	1.0 PPM by weight, maximum

A new brochure is available containing specifications and general information on many of the Celanese* Organic Chemicals. Write for your copy—and call Celanese whenever you need technical assistance regarding organics.

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Formaldehyde, one of the most important products in the growing family of Celanese Organic Chemicals, is now offered in greater volume. This high quality, U.S.P. chemical is sold commercially as Formalin, a water white solution containing 40% formaldehyde by volume, 37% by weight. It is obtainable in both methanol inhibited and uninhibited grades.



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matic hydrocarbons, chlorinated solvents, esters and ketones (except acetone), it offers considerable possibilities in the coating field. Two outstanding advantages of the resin for use in this field are: (1) that solutions of the resin may be sprayed satisfactorily (in contrast to solutions of polystyrene) and (2) that a film may be obtained without use of a plasticizer. Most serious problem involved in using the resin as a coating solution is its tendency to retain some tack. This, of course, may be an advantage in certain applications such as primer formulations where finish coats of a different nature are contemplated and a chemically inert but mildly tacky base coat is desirable.

One manufacturer already is using Isopol resin in solution as a patching compound for glass-lined brewery tanks. Here the facts that the resin solution can be sprayed or brushed on, adheres well to most surfaces and is extremely resistant to caustics and acids, as well as low alcohol concentrations, were considered of primary importance.

Another possible use for Isopol resin in solution is in the field of impregnating compounds. One manufacturer has reported that inner soles can be considerably stiffened by dipping them in a solution of the resin and then drying them.

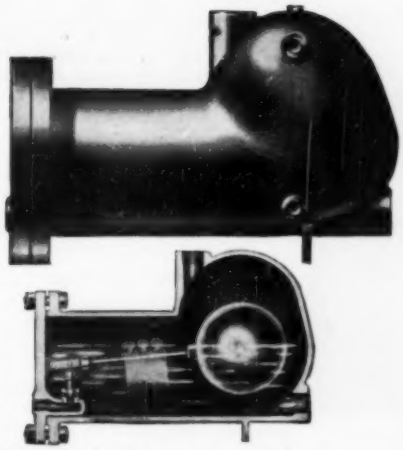
The new resin may be readily emulsified. Considerable research with rubber emulsions for coatings and impregnants of cloth, paper and wood is being undertaken. Also, there appear to be definite possibilities of using the emulsified resin together with waxes to provide added strength and less slip to liquid floor wax formulations.

Technical data sheets and samples of Isopol resin for laboratory investigation may be secured from the Union Bay State Chemical Co. of Cambridge, Mass.

60. Stable Emulsifiers

Two NEW surface-active agents have been announced by the Atlas Powder Co., Wilmington. To be marketed under the trade name Brij, they are for use in emulsifying or wetting where stability to high alkalinity or acidity is of primary importance.

Both products are polyoxyethylene lauryl alcohols. Brij 30 is generally water-dispersible and oil-soluble, being slightly more hydrophilic than Span 20 (sorbitan monolaurate). At 250 deg. C., Brij 30 is an oily lemon-colored liquid with a viscosity of 25–125 cp. Its specific gravity ranges from 0.92 to 0.98. Brij 35 is water-soluble, and compares in hydrophilic



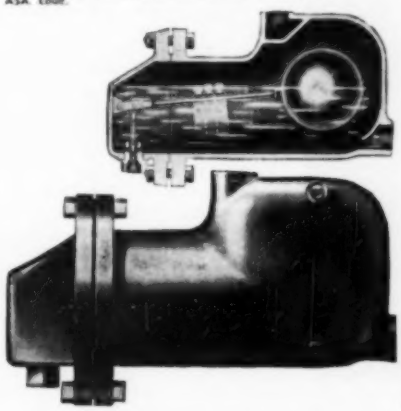
TYPE 90—For Pressures Up to 500 psi.

Semi-steel or cast steel bodies. Eight inch float. For pressures up to 500 psi. Removable orifices are available, to offset limitations of float power and buoyancy. Finely engineered for long life, accurate service.

Climax Drainers serve as steam traps on fractionators, reboilers, kettles and other equipment using steam for heating and where continuous condensate elimination is necessary for accurate temperature control. Use as an air, gas or vapor eliminator from pressure system when inverted. For water trays of distillation columns, drainers for reflux accumulators and other services, a weighted float arm is available to cause float to sink in liquids of higher gravity than 40° API (.825 sp. g.) and float on water.

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Eight-inch float. Accurate, dependable service at pressures up to 600 psi. Ideal for high gravity liquids, corrosive liquids . . . Climax has eliminated stuffing box. Single needle type inner valve seat gives positive shut-off. Head flange construction in accordance ASA code.



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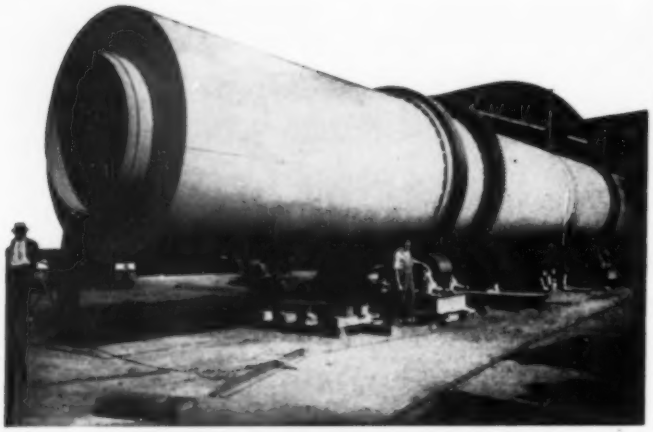
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Internal valve assembly can be removed for cleaning and inspection if necessary. Two-wire—A.C. or D.C.—current failure—packless construction—bronze body—stainless steel and bronze internal parts—soft seats available.

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characteristics to Tween 20 (polyoxyethylene monolaurate). At 250 deg. C., Brij 35 is a waxy solid. White in color, it has a specific gravity of 1.18–1.22 and a titer of 35–36. The Span and Tween products are trade-marked materials of Atlas Powder Co.

Both samples and commercial quantities of the two new surface-active agents, Brij 30 and Brij 35, are now to be had from Atlas.

61. Fluorine-Containing Hydrocarbon

OF INTEREST to researchers and manufacturers of dyes and intermediates is the new fluorine-containing hydrocarbon currently offered by the Hooker Electrochemical Co., Niagara Falls. The compound, 3-nitro-4-chlorobenzotrifluoride, is a thin, oily liquid with an aromatic odor. Its molecular weight is 225.5; freezing point is –7.5 deg. C.; boiling point is 222 deg. C.; and its specific gravity is 1.542. The trifluoromethyl group is chemically stable, but the nitro group may be reduced and the chloro group may be replaced. Technical Data Sheet No. 367 can be secured from Hooker.

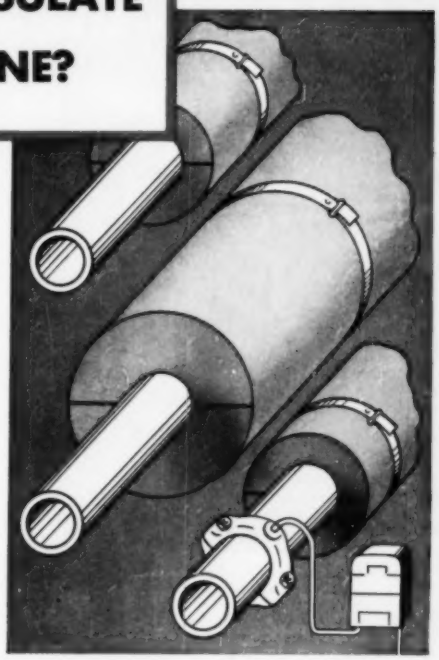
62. Phloroglucinol Derivatives

DEVELOPMENT of two new derivatives of phloroglucinol has been announced by the Edwal Laboratories, Inc., of Chicago. Both derivatives have properties of interest to the cosmetic, soap, paint, dye, plastics and pharmaceutical industries.

First of the new compounds is 5,7-dihydroxy-4-methyl coumarin. The monohydrate, with an empirical formula of $C_{10}H_8O_4 \cdot H_2O$, has a molecular weight of 210. This compound is a yellow, free-flowing material with a melting range of 280-286 deg. C. and a moisture content of 9 percent. It is soluble in alcohol and aqueous alcoholic solutions, sodium carbonate and sodium hydroxide solution, and it is insoluble in ether, benzene and water. The other phloroglucinol derivative is 5,7-dihydroxydimethyl coumarin. With an empirical formula of $C_{11}H_{10}O_4$, it has a molecular weight of 206. Its melting range is 300-305 deg. C., and its moisture content is 5 percent. In other physical properties it is similar to the mono-methyl compound just described.

The mono-methyl derivative is fluorescent, absorbs ultraviolet light and prevents sunburn, hence it is of value in suntan oils and creams used as sun screens. Thus it has value in cosmetics. In soaps the compound has

HOW WOULD YOU INSULATE THIS HOT LIQUID LINE?



A 3" line running 100' through a 75° F. room carries a hot, viscous fluid at 225° F., flowing continuously at the rate of 40' per minute. Temperature of the fluid at the delivery end must not drop more than 5° F. How would you hold the proper temperature in the line?

- ☐ Standard thick 85% Magnesia
- ☐ 3-inch thick 85% Magnesia
- ☐ External heat source and Standard Thick Magnesia

Here's what the Armstrong engineer recommended:

In industries where control of process temperatures is vital to successful operation, insulation can be designed to help hold those temperatures accurately. Writing the specification that best meets the requirements of the job calls for careful study of all factors involved, as well as a thorough knowledge of just what insulation can do and its limitations.

In the problem outlined above, with the liquid flowing through the pipe continuously, the Armstrong engineer calculated that 3" of 85% Magnesia would hold the temperature to within the allowable 5° of 225° F., at the delivery end of the 100' run of pipe.

However, on jobs where pipe runs are long and flow is intermittent, no practical amount of insulation will prevent a viscous liquid from cooling and solidifying in the line. Under these conditions, an external heat source, such as charging the line with a low voltage or running a steam tracer, should be used. These methods also need insulation to operate efficiently.

Whether you need insulation to make a process work, or to cut heating or power costs, Armstrong engineers are well qualified to help you arrive at the right specification for the particular job. And the complete contract service for heat insulation offered by Armstrong also includes a full line of top quality materials and skilled workmen to apply them.

FREE INSULATION CHART

This chart lists types and thicknesses of insulation for temperatures from 300° below zero to 2800° F. Write today to Armstrong Cork Company, Industrial Insulation Department, 3302 Maple Ave., Lancaster, Pennsylvania.



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Lunkenheimer Valves in the process lines at the fermenters used in the production of penicillin and streptomycin.

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For dependability over long periods of service, these valves at Abbott Laboratories illustrate the way all phases of industry and commerce rely on Lunkenheimer Valves. This same low-cost service can be a profit factor in your operations.



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Coupon on pages 169-170

distinct uses as a whitening agent. In dyestuffs the compound gives a gleaming white color to clothes and wall paint. It makes plastics clear, either white or opaque. A small proportion added to yellow plastic, for example, will give a white or clear product. Since it is structurally similar to other coumarin compounds used in anti-coagulants, the phloroglucinol derivative will find uses in the pharmaceutical field. The dimethyl derivative has similar possibilities. Both of these chemicals are now being made available in research quantities by Edwal.

63. Sodium Chloroacetate

AT ITS Niagara Falls, N. Y., plant, the Hooker Electrochemical Co. is now producing sodium chloroacetate (Cl-CH$_2$-COONa) in pilot-plant quantities. This compound is a white non-hygroscopic powder. It dissolves completely and rapidly in water.

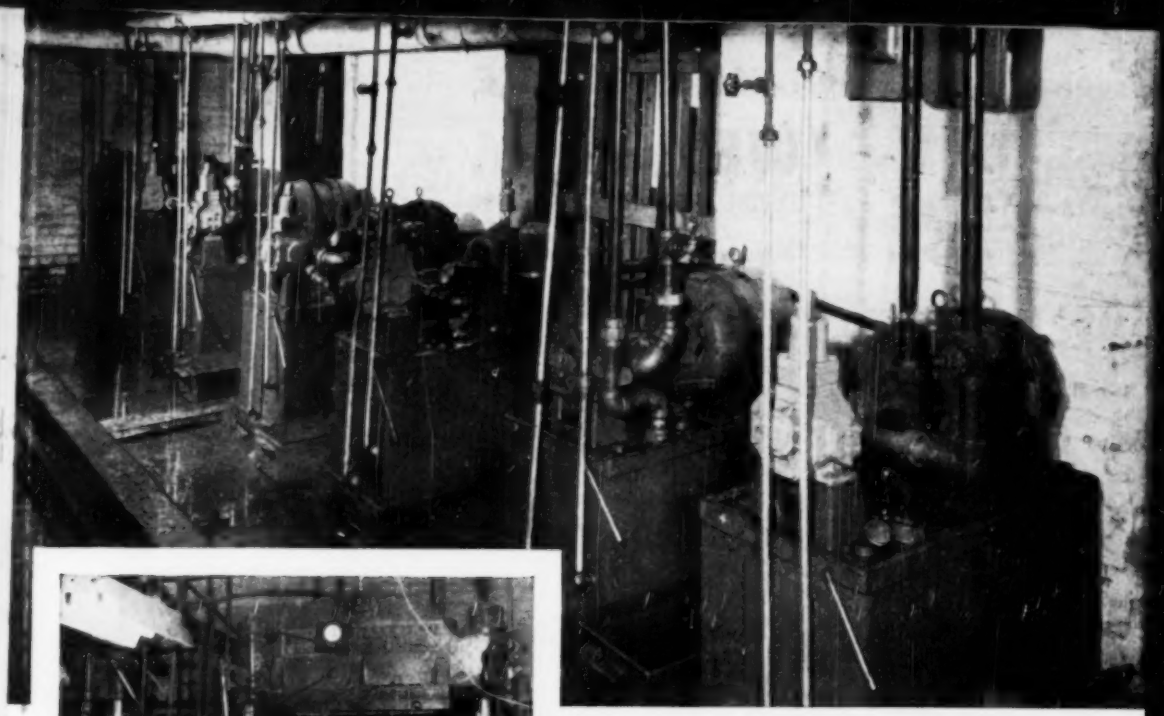
Sodium chloroacetate may be used in the preparation of various acetates and glycolates. In general, it may be used in place of monochloroacetic acid. The sodium salt has many advantages over the acid, particularly with respect to storage and handling. In chemical processing, its use eliminates the usual neutralization step required for the acid.

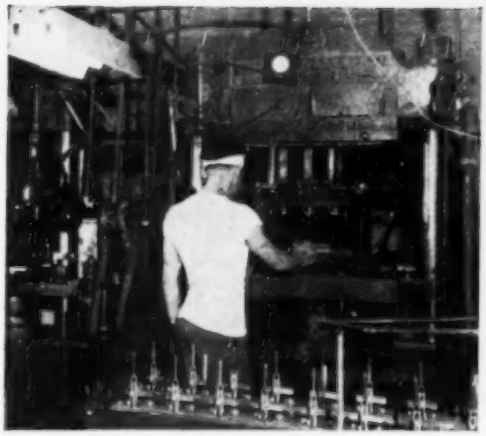
64. Wetting Agent

DESIGNED to give quick and effective wetting at low unit cost, Santomerse 30-X is a synthetic detergent that will be of particular interest to the textile industry. According to its manufacturer, the Monsanto Chemical Co. of St. Louis, the low cost of Santomerse 30-X has been achieved by process improvement. A viscous fluid with a pale lemon color, the wetting agent is an alkyl aryl sulphonate type.

Santomerse 30-X is a clear, extremely light-colored solution, containing 30 percent solids. The solids content is made up of about 85 percent active alkyl aryl sulphonate and 15 percent sodium sulphate. The product has remarkable resistance to decomposition by either strong acids or alkalis, even under extreme conditions.

Santomerse 30-X liquid wetting agent is recommended by the manu-





Stanoil 95 Industrial Oil

Are your hydraulic operations as free of trouble as this?

THE HYDRAULIC UNITS shown above are used for the operation of plastic-moulding presses in a midwest plant. Hydraulic oil pressures reach 2500 psi. Oil temperatures average between 120° and 130° F. Presses, operating on a three-shift basis, require 24-hour operation of the hydraulic units.

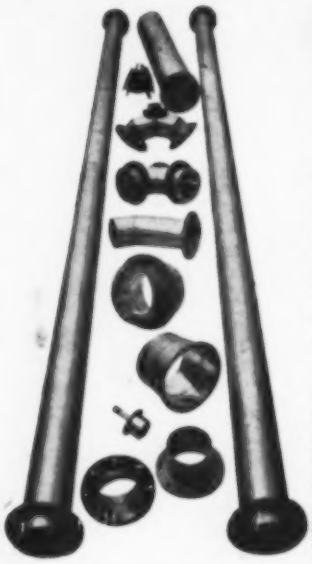
Stanoil 95 has been used as the hydraulic medium in these units for well over a year. During this period of hard, continuous service, the hydraulic oil systems have required no cleaning. No oil changes have been necessary. Hydraulic controls have functioned smoothly.

How does this hydraulic oil performance compare with that in your plant? If you are experiencing trouble with oil deposits, oil deterioration, or oil foaming, you can benefit by changing to Stanoil. This multi-purpose industrial oil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems.

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Shown here are Weldco stock lines of 8-5/8" O.D. x 16 gauge wall thickness, with Van Stone type joints . . . tubing and fittings — now in use in one of the South's largest pulp and paper mills. Why not investigate Weldco's cost-cutting, long-service possibilities for your plant? Send today for a free copy of the new Weldco booklet.

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facturer for wet processing of textiles. Many other applications are possible where surface tension reduction and quick wetting are desired. Its attractive color, viscosity and high detergent value also make Santomerse 30-X suitable for liquid cleaners.

65. Vitamin B_{12} From a Mold

CRYSTALLINE vitamin B_{12}, for the treatment of pernicious anemia, can now be produced by fermentation. Workers at the research laboratories of Merck & Co., Inc., of Rahway, N. J., have isolated crystalline vitamin B_{12} from mold. This mold, *Streptomyces griseus*, belongs to the same species as that which produces streptomycin, the new drug used so successfully in the treatment of certain types of tuberculosis. In probing for B_{12} sources other than liver, the research workers found that many natural products; such as, milk powder, beef extract and culture broths of several bacteria and molds, showed microbiological activity similar to that of the new vitamin. As the result of intensive investigations of culture broths from *Streptomyces griseus*, a red crystalline compound was isolated. Tests proved this to be identical with the B_{12} isolated from liver.

This achievement is similar to developments with other vitamins. Vitamin B_2 (riboflavin), biotin, folic acid and other members of the B complex are known to be produced by many bacteria and molds. In April 1948 this same group of Merck researchers isolated vitamin B_{12} from liver for the first time, thus ending a 22-year search for the factor in liver that counteracts pernicious anemia. Other medical investigators have confirmed that B_{12} can be substituted for liver therapy in treatment of this disease.

Other tests indicate that the new vitamin is an important nutritional item. B_{12} speeds the growth and improves the health of poultry and other animals. This is one of the most important elements of the so-called "animal protein factor."

Significance of this research finding is that the new vitamin can be "grown" from a mold. This is an important stride forward from having to work up huge quantities of liver for its isolation. The next step will be to produce this vitamin in quantities adequate for widespread medical and nutritional use. Merck is now working intensively on this problem, but has not yet reached the stage where promises can be made. Investigations are being pushed to realize the potentialities of this new vitamin for promoting human health and aiding animal nutrition.



PUBLISHED MONTHLY FOR PROCESS INDUSTRIES EXECUTIVES AND OPERATING PERSONNEL

THREE MAJOR CONSIDERATIONS GOVERN SELECTION OF A DRYING SYSTEM

CAPACITY REQUIREMENTS



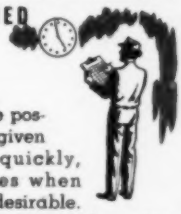
One of the first factors that must be considered when a drying problem is being studied, is the capacity that will be required of the dryer. Sometimes this capacity requirement is already determined by the flow of material coming from preliminary equipment and the amount required in subsequent processing. At other times, however, capacity needs are known in a general way and the preliminary and subsequent equipment can be geared to dryer capacity. At any rate, in order to make intelligent recommendations, Proctor engineers must know at least roughly the capacity at which the plant is aiming.

PHYSICAL CHARACTERISTICS OF PRODUCT



The type of system that will best suit the needs of the plant will be governed by another factor—the physical characteristics of the product. The characteristics of some products permit through-circulation—while others must be dried by cross circulation. Some products are suitable to continuous conveyor drying, while others must be loaded onto trays and dried in tray dryers or truck dryers.

RATE AT WHICH PRODUCT MAY BE DRIED



While it may be possible to dry a given product very quickly, there are times when this may not be desirable. Often to retain certain characteristics the rate of drying must be relatively slow. When you combine this limitation with the desire for high capacity output—it becomes apparent that the dryer research engineer is frequently confronted with a difficult problem.

RESEARCH RELATES PROBLEM and DRYER DESIGN

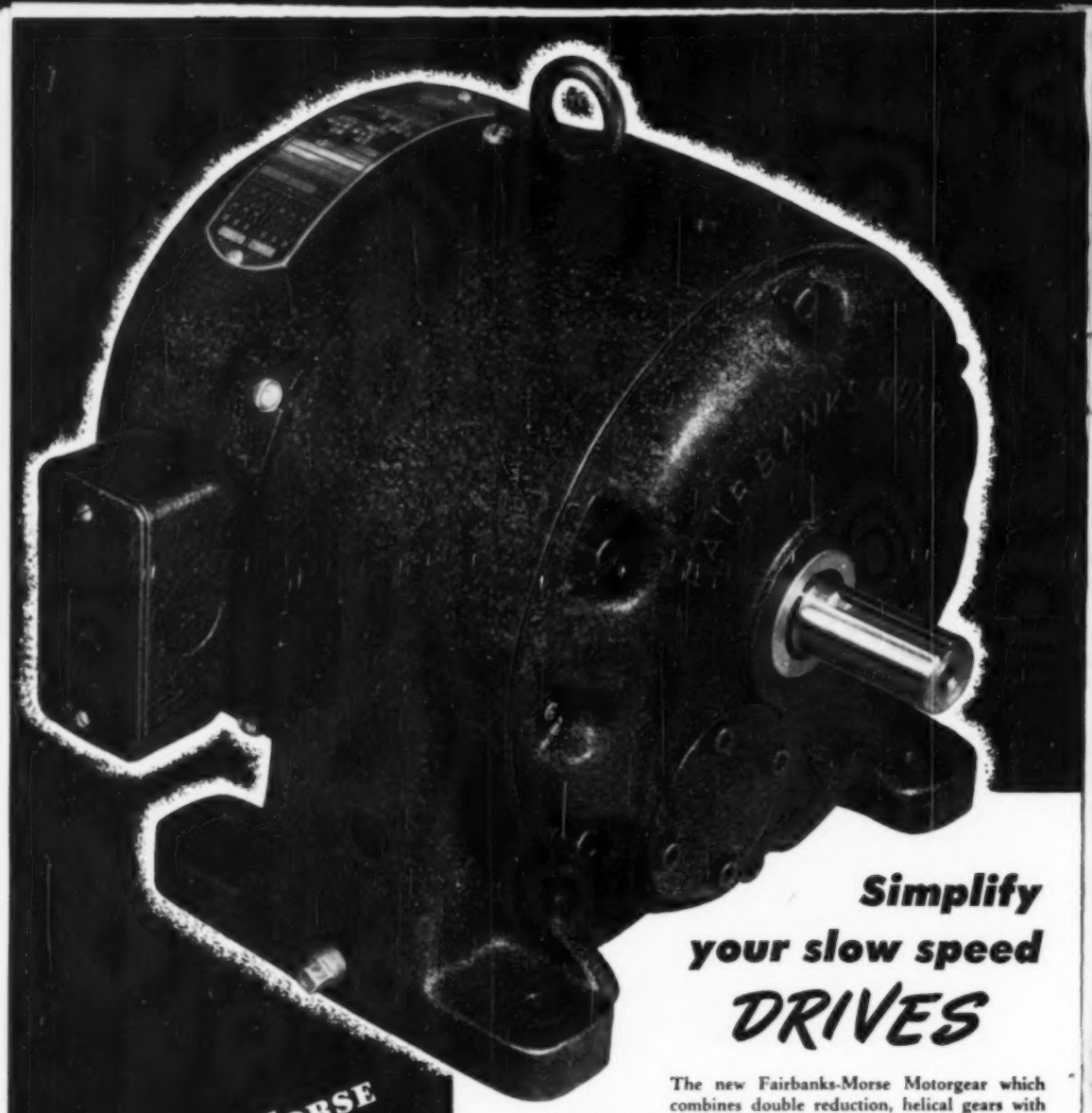
A thorough study of any given problem is the only way in which it is possible to determine accurately the type of drying system best suited. Carefully investigating the known capacity requirements, the physical characteristics of the product, and the rate at which the product may be dried—Proctor engineers are able to relate the problem to existing commercial practice and make recommendations intelligently.

The table below gives a very quick picture of the basic types of Proctor equipment for the process industries together with its generally accepted use. If you have a drying problem you will find it decidedly advantageous to have Proctor engineers consider it from all angles and recommend the system best suited to your individual needs.

BASIC TYPES OF PROCTOR EQUIPMENT FOR THE PROCESS INDUSTRIES

TYPE	RECOMMENDED FOR
Electrically Heated Laboratory Dryer	Small Laboratory samples of materials that may be dried on trays or hung on rods or hooks.
Variable Circulation Laboratory Dryer	Laboratory work where wide variety of products must be tested—or where same product is to be tested under varying drying conditions.
Standard 10 and 20 Tray Dryers	Moderate output of powdered, granulated or pellet type materials. Also where wide variety of products must be dried in individual batches.
Thru Circulation Tray Dryer	For products that are to be tray dried but are of such physical composition that air may be circulated through material. Makes possible speedy drying.
Truck Type Dryers	Relatively high output for products not well suited to continuous conveyor drying because of physical characteristics or length of drying time required.
Continuous Conveyor Drying Systems	Tonnage output for products which may be "preformed" in such a way as to be adaptable to continuous conveyor handling.

Much Proctor drying equipment and textile machinery is covered in full or in part by patents or patents pending.



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MEN, MACHINES AND METHODS

Roger Williams, Jr., ASSISTANT EDITOR

Are Profits Too High?

Compared with previous years dollar profits look high, but they have to be to sustain prosperity.

SINCE much of this issue is devoted to financial matters, this is perhaps a good time to discuss one aspect of our financial economy in Men, Machines and Methods. Oddly enough, we want to take our text from Nat Weinberg of the CIO: "My purpose will have been accomplished if I have aroused in you a desire hereafter to look behind the ballyhoo to the facts underlying our economic problems." We may differ a bit with the CIO on what those facts are, but perhaps that will be interesting in itself.

One of the biggest arguments going on today is whether or not corporate profits are too high. Even a joint Congressional committee has been investigating.

To start, let us quote again from Mr. Weinberg. He gives the CIO's opinion in a speech presented to the Third Annual Public Affairs Conference of the Yale Law School in December.

"We want to see a proper balance established among wages, prices and profits. By this we mean that wages should be high enough to balance consumption against our potential output of consumer goods *leaving enough economic resources for maintenance, modernization and expansion of our productive equipment at a reasonable and socially desirable rate that can be sustained year in and year out.* (Italics supplied.)

"This last element, a rate of investment that can be sustained, is of extreme importance. I am glad Senator Flanders is here because I would like to note that we agree with his statement of three years ago in the *American Political Science Review* that our boom-bust cycle arises in large part from an uneven rate of capital investment.

"We fear unduly high profits for just that reason. When profits grow too large they tend to concentrate investment demand into short periods of time so that it expands to the point where it competes with consumer demand, gives further impetus to inflation, and brings on an economic crack-up in which consumer demand shrinks sharply and investment demand virtually disappears."

There are few who will argue with the above. McGraw-Hill long ago pointed out the relationship between the country's economic health and business capital expenditures (see *Chem. Eng.*, Feb. 1948, p. 103). They go hand in hand, and undoubtedly are one of the reasons adding to the sharpness of our economic rises and falls.

One of the facts that must be thought about, however, is that capital expenditures must remain high if we are to have prosperity over a continuing period. The number of people employed by the construction and capital goods industries is tremendous. It must remain high if we are to maintain our growing working force, some 60,000,000 persons today.

If industrial construction, particularly, is to remain high, two requirements must be met. First, there must be an incentive for companies to expand. Second, there must be a source of capital to finance the expansions.

What about incentives? Basically, there is only one incentive to put capital into new plants or new ventures. That incentive is profit. The trouble is that every time a company builds a new plant, and hence makes a bit more profit, everybody hollers the company's profits are too high. Then, the present taxation system does not help.

When the corporation income tax is piled on top of personal income taxes, profits on a new product have to be tremendous to give the individual who does the work and supplies the money even a small increase in net income.

This whole situation becomes a vicious cycle when the second requirement, sources of funds for capital expansion, is considered. It is pretty obvious today that the only source left for financing new plants is profits. The current equity markets are dry as a bone. On top of that, most companies have built up as much funded debt or preferred stock as their capital structures can stand. Therefore the only place left to get capital is to take it out of profits.

So now, we have come around to the main point. What do profits look like? Are they too high, as the CIO and others maintain, or are they too low, as the Chamber of Commerce and others claim?

First, let's take the CIO's claim that profits should be cut. Based on factory payrolls, the CIO says that today's wages should go up by 20 percent just to restore the same living standard a worker had in January 1945. This figure assumes, of course, no rise in the cost of living or in prices.

Can such a thing be done? The CIO says yes. Here's the CIO's argument: "Industry, of course, will deny that any such increase is possible without further boosts in prices. Yet, elementary arithmetic demonstrates that a 20 percent increase in all corporate wages and salaries—including salaries of executives—is well within the realm of realistic possibility."

Here is the CIO's arithmetic: "Corporations are now paying out wages and salaries at a rate of $87 billion a year. A 20 percent increase would amount to $17.4 billion. Since corporation profits before taxes are running at the rate of $35 billion a year, a wage and salary increase of this magnitude would leave $17.6 billion. After paying corporate taxes of 38 percent on this amount there would remain $10.9 billion. This, be it noted, is greater than the peak wartime profits of 1944. It is more than two and a half times as great as the average profits of the years 1936-39 which Congress con-

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sidered normal for wartime excess profits tax purposes."

Well, that "elementary arithmetic" sounds good, but what would happen if the 20 percent rise occurred?

Sources of Capital

Suppose we start with the premise that construction volume must be continued at about its present levels to maintain prosperity. If it is maintained, we should be able to keep our employment level over 60,000,000. If that is true, corporations must have a source of funds totaling about $18 billion each year.

Where will that $18 billion come from? Well, first we can look to the security markets. According to the SEC, total corporate security offerings, including both stocks and bonds, have ranged near $6 billion for the last four years. In 1948 about $1 billion of this went for debt retirement or refunding or other uses and about $5 billion was available for new plants and equipment. That leaves about $13 billion to be found.

The next source of money for construction is depreciation. That totals about $4.5 billion, according to the McGraw-Hill economics department. So now we have about $8.5 billion to find.

There seems to be only one other place to look for that $8.5 billion: corporation profits. And that means corporation profits after taxes and after dividends. Not many people will argue that current dividends are too high. They are one thing that has not increased anywhere near the rate of increase of the cost of living. So let us

New York City street cleaners are not street cleaners—they are sanitary engineers. And down at Joseph E. Seagram & Sons in Louisville janitors are not janitors, either—they are "sanitors." What is more, Seagram puts out a news letter for sanitors. They call it the "Sanitation News Letter." We did not know there was such a thing but apparently it has been going on for a long time. The copy that came over our desk recently was Vol. 3, No. 12.

In this letter are a number of useful hints. We will pass this one along to you, and others in the future when we feel you can benefit from them. "Unless area assignments are specifically defined there frequently will be overlapping of sanitor responsibility. Specific, written assignments can be instituted, the physical limits of which are well understood by sanitor and supervisor." Fine Mr. Seagram, but what about our old janitor (pardon, sanitor) who can't read?

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say that current rates are about right—roughly $7 billion each year.

By addition, that means corporate profits, after taxes, must be at least $15.5 billion. If the CIO's plan of a 20 percent wage increase were put into effect, corporate profits would be only $10.9 billion.

If the above arithmetic is correct, and we think it is, the CIO's wage raise plan is obviously unsound—unless the CIO can find a way to finance $4.6 billion worth of construction.

Suppose, now, we look at the situation another way. Knowing the current rate of profits, how much excess is available for either higher corporate taxes or increased wages without an increase in prices being needed. Here is the picture briefly:

	Dollars (Millions)
Money Available	
Gross profits	35,000
Security markets (net)	5,000
Depreciation	4,500
Total	44,500
Money Required	
New plant & equipment	18,000
Additional working capital	5,500
Taxes	12,000
Dividends	7,000
Total	42,500
Excess	1,000

If the above figures are about right, the only margin which could possibly be used to increase wages or taxes without increasing prices is about $1.0 billion. That sounds like an awful lot of dollars, and it is as a lump sum. But it is only a little more than 1 percent of our current wages and salaries total. It is so small a margin that it could easily be wiped out.

There has been a lot of talk about increasing corporate taxes. In his "State of the Nation" speech to Congress, President Truman specifically proposed increased corporate taxes. Said Truman, "I recommend, therefore, that the Congress enact new tax legislation to bring in an additional $4 billion of government revenue. This should come principally from additional corporate taxes. A portion should come from revised estate and gift taxes. Consideration should be given to raising personal income tax rates in the middle and upper brackets."

It seems hardly possible from the above figures that corporate taxes could go up anywhere near $4 billion and not mean either an increase in prices or a decrease in construction employment. Such a decrease as the latter might well start a downward spiral.

Perhaps those who maintain that corporate profits are too high should also "look behind the ballyhoo to the facts underlying our economic problems."



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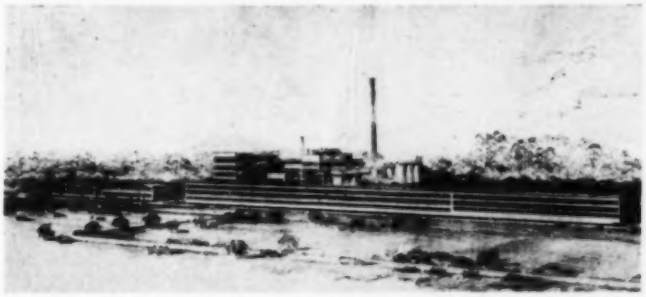
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CHEMICAL ENGINEERING NEWS

Richard F. Warren, ASSISTANT EDITOR



RAYON PULP from hardwood will be made at International's new Natchez mill.

Rayon Pulp Mill To Be Erected In Mississippi Will Use Hardwoods

As a result of a recent bond election, the International Paper Co. is planning to build a $20,000,000 rayon pulp mill at Natchez, Miss., on a 1,000-acre site which the city is preparing to provide.

International's new mill will be the first in the world designed to employ an entirely new process for producing dissolving wood pulp used in the manufacture of rayon and other synthetic products. Hardwoods instead of softwoods can be used.

The new process is based on the sulphate or kraft technique instead of the sulphite method used traditionally for making such pulps.

The new mill will be a market for about 270,000 cords of pulpwood a year, and will produce about 300 tons of rayon pulp per day, according to Major Jack Friend, vice president of the Southern Kraft Division of the company.

When in operation, the mill will employ approximately 800 persons.

It is estimated that about 15 months will be required to get the plant into operation once it is started.

The City of Natchez has voted a $300,000 bond issue to provide funds for purchase of the site for the mill. Issuance of such bonds for erection of factory buildings or purchase of sites for new industries is permitted under a Mississippi law known as BAWI (balance agriculture with industry).

Natchez is also the site of a recently opened $12,000,000 Johns-Manville Corp. wallboard plant, which was dedicated late in 1948.

Mississippi produces in excess of 2 billion board feet of timber annually, approximately 100,000,000 ft. of hardwood.

Vice President Friend says the mill will draw on timber from along the nearby Mississippi River if the need ever arises, a move which would bring waterway transportation into the picture.

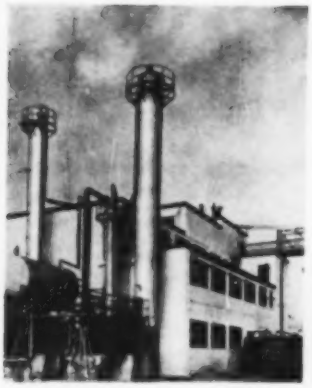
CCDA Holds Chicago Meeting On New Product Development

The Commercial Chemical Development Association held a very interesting, timely all-day meeting at the LaSalle Hotel, Chicago, on January 19.

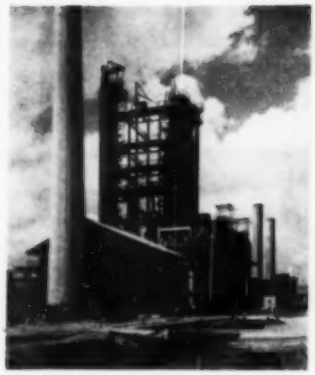
W. B. Plummer, president of Indoil Chemical Co. and chairman of the committee which arranged the meeting, acted as moderator. The panel members were: D. K. Ballman of Dow Chemical Co.; H. M. Corley of Armour & Co.; F. J. Curtis of Monsanto Chemical Co.; A. L. Elder of Corn Products Refining Co.; J. M. Gillet of Victor Chemical Works; L. B. Hitchcock of Quaker Oats Co.; J. J. Schaefer, formerly of Wyandotte



FIRST SHIPMENT from Swift & Co.'s new industrial oil processing unit at Hammond, Ind., was made last month. W. F. Oyler, Lever Brothers Co., accepted the first tank car from E. A. Moss (right), vice president of Swift.



TRICHLORETHYLENE will be made at Niagara Alkali's plant at Niagara Falls.



PETROLEUM expansion at Port Arthur is typified by this new Gulf Unit.



HYDROCHLORIC by Dow will move in these huge Dravo-built tank-barges.

Chemicals Corp., and C. W. Walton of Minnesota Mining & Mfg. Co.

Subjects designed to bring out policies and procedures followed by various companies in commercial chemical development were discussed.

On March 16, CCDA will hold its annual meeting in New York at the Hotel Roosevelt. R. W. Kixmiller, Celanese Corp. of America, has arranged an interesting program with speakers on toxicological problems, isotope distribution, and sales promotion in new product development.

Du Pont Sets Up Grants to Stock-Pile Knowledge

Du Pont has announced that it is starting a program of grants-in-aid to ten universities for the 1949-50 academic year for unrestricted use in the field of fundamental chemical research. The program, which at the start will be on a trial basis, has the aim of raising the amount of such research being done in this country above present levels, with a view to "stockpiling basic knowledge."

In announcing the new program, Crawford H. Greenewalt, president of Du Pont, said that these grants-in-aid are designed to help insure the flow of fundamental knowledge in science upon which the future industrial development of our country and the standard of living of the American People are so dependent.

The universities to which grants-in-aid of $10,000 each are being offered are California Institute of Technology, Cornell, Harvard, Massachusetts Institute of Technology, Ohio State, Princeton, Yale, Illinois, Minnesota, and Wisconsin.

Garfield Chemical Plans Sulphuric Expansion

Demand for sulphuric acid in the Intermountain area has risen sharply during the past few years because of expanded fertilizer, steel and other processing operations. Only one of the area's producers to expand was Anaconda Copper Mining Co., and a large part of this additional output is used in the firm's own operations.

Garfield Chemical & Mfg. Co. plans for a two-year $6,250,000 acid expansion at the Garfield, Utah, smelter. Increase in sulphuric capacity has not been given, but estimates run as high as 250 percent over the present 200 tons daily. Garfield would then become one of the largest acid plants in the nation.

Construction will begin as soon as engineering details are completed. No new housing will be required, since the present unit occupies only one corner of a 270 x 85-ft. brick building that once housed a contact unit. New facilities will be of the contact-type and will use smelter gases containing about 5 percent SO_2.

Kraft Pulp to Paper Bags at St. Regis Tacoma Unit

The new kraft paper mill of St. Regis Paper Co. at Tacoma, Wash., is housed in a two-story 72 x 612-ft. building. The fourdrinier machine will produce up to 2,100 ft. of 168-in. paper each minute, representing a daily capacity of 240 tons. The bag factory will convert some 50,000 tons of this paper yearly into multiwall bags.

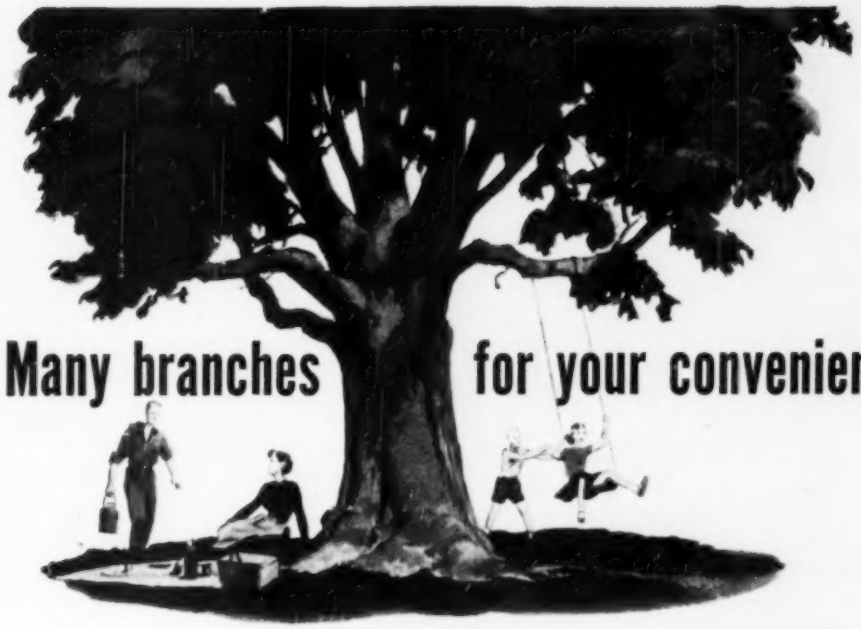
This new $6,000,000 addition to St. Regis kraft facilities—eighth to be built—was first announced as under way in late 1947. Its completion represents the last phases of a integration, modernization and expansion program throughout the country. Previously, sulphate pulp produced at Tacoma had been sold or converted at other kraft paper mills owned by the firm. Since not all of the pulp will be converted, a portion will still be available to customers.



D. S. Frederick

PMMA Elects Officers At New York Meeting

D. S. Frederick of Philadelphia, vice president of Rohm & Haas Co., was elected president of the Plastic Materials Manufacturers Association



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at its annual meeting in New York last month. Felix N. Williams of Springfield, Mass., vice president of the Monsanto Chemical Co. and general manager of its plastics division, was elected vice president of the association. Officers re-elected are F. H. Carman, secretary-general manager, and John E. Walker, treasurer. Newly elected members of the board of directors are J. R. Hoover, vice president of B. F. Goodrich Chemical Co. and Alan N. Mann, chairman of the board of Catalin Corp. of America. Directors continuing on the board in addition to Dr. Frederick and Mr. Williams are D. M. Rugg, vice president, Koppers Co., Inc.; W. W. Knight, Jr., general manager, Plaskon division, Libbey-Owens-Ford Glass Co.; and S. E. Palmer, assistant vice president, Tennessee Eastman Corp. Arnold E. Pitcher, E. I. du Pont de Nemours & Co.; J. L.

CONVENTION CALENDAR

American Institute of Chemical Engineers, regional meeting, Los Angeles, Calif., March 6-9.

American Chemical Society, 115th national meeting, San Francisco, Calif., March 27-April 1.

American Society of Brewing Chemists, annual meeting, Roosevelt Hotel, New Orleans, April 10-14.

American Institute of Electrical Engineers, conference on industrial application of electron tubes, Statler Hotel, Buffalo, April 11-12.

National Association of Corrosion Engineers, annual conference and exhibition, Netherlands-Plaza Hotel, Cincinnati, April 11-14.

American Ceramics Society, national meeting, Netherlands-Plaza Hotel, Cincinnati, April 24-28.

Electrochemical Society, spring meeting, Benjamin Franklin Hotel, Philadelphia, Pa., May 4-7.

American Oil Chemists Society, annual meeting Hotel Roosevelt, New Orleans, May 9-10.

Instrument Society of America, spring meeting, Royal York Hotel, Toronto, May 12-13.

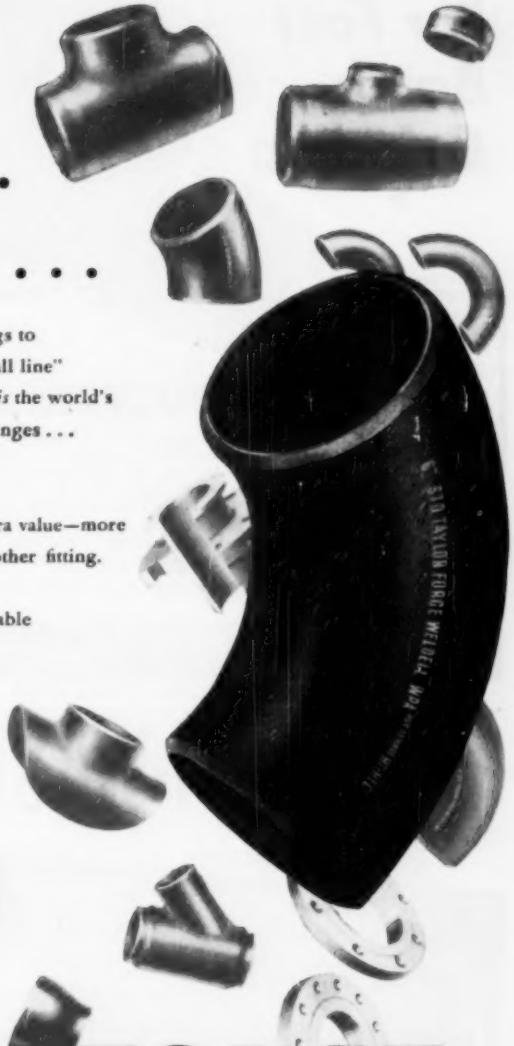
Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Detroit, May 19-21.

Manufacturing Chemists Association, annual meeting, Skytop, Pa., June 2.

Packaging Institute, annual forum, Commodore Hotel, New York, October 24-26.

22nd Exposition of Chemical Industries, Grand Central Palace, New York, November 28-December 3.

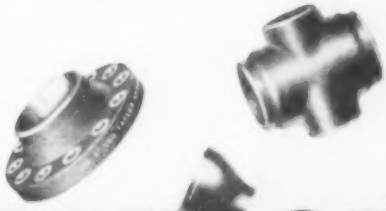
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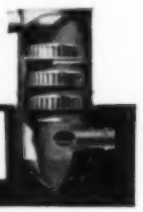
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Rodgers, Jr., American Cyanamid Co.; and W. S. Landes, Celanese Corp. of America, former presidents of the association, were named to serve the board of directors in an advisory capacity.

The resin adhesives division of the association elected as its chairman P. A. Macy, chief chemist, Perkins Glue Co., Lansdale, Pa.

AEC Plans $90 Million Expansion at Oak Ridge

THE IMPORTANCE of Oak Ridge, Tenn., as a center for the development of U-235 and for research in the development of its use, seems more than assured with the announcement by Chairman David E. Lilienthal that the Atomic Energy Commission plans a $90,000,000 expansion program there.

Speaking before a community meeting at Oak Ridge, January 6, Mr. Lilienthal said that the expansion will include a $70,000,000 gaseous diffusion plant and a $20,000,000 permanent Oak Ridge National Laboratory. Work is now under way on the $1,500,000 of radioisotope processing facilities at the laboratory.

Engineering plans are now being drawn for the new plant to produce U-235. This will be known as the K-29 and will cost $70,000,000. Work is to start within the next six months, will take about two years to complete and give employment to 3,500 construction workers.

Mr. Lilienthal said that engineering studies are now nearing completion on a master plan for the permanent National Laboratory. Details for some of the new facilities are being drawn, and new research facilities for the health physics, metallurgy and biology divisions have been completed and put into service.

"All of these activities," Mr. Lilienthal said, "will serve to emphasize that Oak Ridge is now the world's capital in the peacetime uses of atomic energy." He said that most of the world's supply of radioisotopes are produced at Oak Ridge. "The new construction will strengthen the country's position in this vital peacetime activity," he declared.

Mr. Lilienthal pointed out that AEC management is continuing to increase efficiency in all phases of activity. He said that the trend is to get more results with fewer people.

"The gaseous diffusion plant operated for us by Carbide and Carbon Chemicals Corp. is producing considerably more products (U-235) today than it did two years ago, but with 4,000 fewer people on the pay-



Welcome the man who presents this card. He's ready and anxious to help you increase consumer good will by protecting your product against the hazards of shipping—and to help you increase sales through better packaging.

GAYLORD CONTAINER CORPORATION
General Offices: SAINT LOUIS

Corrugated and Solid Fibre Boxes • *Folding Cartons* • *Kraft Grocery Bags and Sacks* • *Kraft Paper and Specialties*

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ON FABRICATED WIRE ASSEMBLIES FOR BULK HANDLING & PROCESSING



Special fixtures for heat treating and other processes.



Woven wire slings reduce accidents—simplify bulk handling and shipping of pipes, tubes, shapes, etc.

Cambridge offers the engineering and fabricating facilities to supply you with baskets, trays, racks, crates or specialized fixtures in any metal or alloy . . . custom-built for your particular requirements.

Cambridge wire fabrications are "job-fitted" for all types of bulk handling and processing to insure maximum efficiency.

For information on the complete Cambridge line, write for your FREE copy of this illustrated booklet. Consult your Cambridge Field Engineer on any individual problem.



There's a Cambridge Sales Engineering Office Near You.

Cambridge Wire Cloth Co.

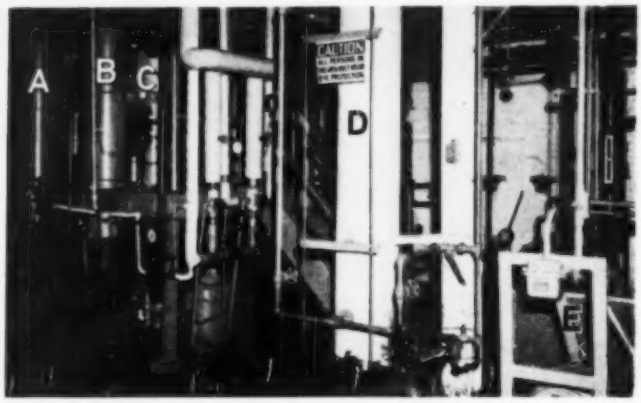
Dept.G · Cambridge 2, Md.

Wire cloth in rolls. | Any metal or alloy, mesh or weave.

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

roll, a reduction from 8,800 employees to 4,800 today, with greater output.

"The Roane-Anderson Co. operating Oak Ridge community facilities has cut its payroll from 4,300 six months ago to 2,700 today—1,600 less. The belt is going to be tight when we get through."



OXO pilot plant of Rohm & Haas (above) includes CO and H_2 storage (A), high pressure receiver (B), liquid level control (C), reactor (D), and reactant pump (E).

Rohm & Haas Starts Oxo Pilot Plant Output

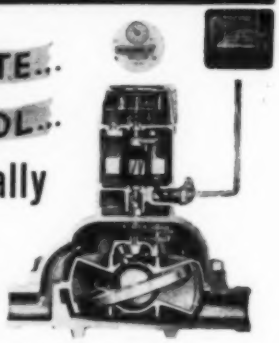
SIX NEW organic chemicals are now being made in pilot-plant quantities by the Rohm & Haas Co., Philadelphia. These chemicals are derived from 3,5,5-trimethyl hexaldehyde, a nine-carbon aldehyde. The aldehyde, in

HAYS VERIFLOW METER *and* **HAYS VERITROL**

MEASURE...INDICATE...

TOTALIZE...CONTROL...

the flow of practically all liquids



Maintaining the proper flow of liquid is a relatively simple job, once a Hays Veriflow Meter and Hays Veritrol Controller are installed. They supplant guesswork with dependably accurate measurement and control of both the rate of flow and total flow of practically any piped fluid. What's more, the rate-of-flow indicator is designed for remote reading. Result: accurate measurement, product control, cost control, uninterrupted service. If you make or use liquid in volume, it will pay you to consider this modern flow meter.

WRITE FOR **BULLETIN 48-766**

The HAYS CORPORATION

COMBUSTION & INDUSTRIAL INSTRUMENTS

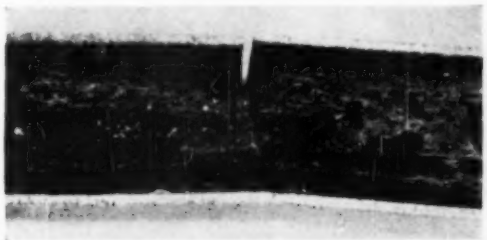
MICHIGAN CITY, INDIANA, U.S.A.

Lengthening Tube Life

Combating the Effects of Ammonia and Vibration

Condenser and heat exchanger tubing in the chemical, petro-chemical and refining industries is subjected to exceptionally severe corrosive conditions. Copper-base alloys, in most cases, successfully resist corrosion from both the water side as well as from the product side of the tubes. However, where ammonia or nitrogen compounds capable of producing ammonia come in contact with the tubes, season cracking of susceptible brasses may take place. This is similar to the type of cracking which may occur under certain conditions with other metals – carbon steel when affected by certain caustic solutions, stainless steel by acid chlorides, aluminum and magnesium by sea water, plastics by certain solvents, rubber by oxidation, etc.

Effect of Alloy Composition. With conditions which may lead to season cracking of brass, we suggest the use of Copper or Cupro Nickel which are most resistant to this type of attack. Aluminum Bronze and Red Brass are next in order, while hard-drawn Admiralty, Aluminum Brass and Muntz Metal alloys are least resistant to season cracking.



Corrosion fatigue crack viewed from the inside surface of condenser tubing.

Such applications as ammonia refrigeration systems and the manufacture of ammonia compounds, using Duplex Tubing of steel to the ammonia side and copper or a copper-base alloy to the water or brine side are giving excellent service. Steel withstands the ammonia while the copper, brass or bronze successfully resists the action of water or brine which would quickly corrode the steel.

Effect of Excessive Vibration. Excessive vibration accelerates corrosion and may cause corrosion-fatigue cracking of metals under certain conditions. The combined action of corrosive waters and excessive vibration of the tubing may lead to more damage than would be produced by either of these factors alone.

The pulsating impact of vapor or liquid against the tubes may cause excessive vibration of the tubing and frequently leaves evidence in the form of roughened outside surfaces. The evidence of excessive vibration can be seen sometimes as abrasion marks on the outside of the tubes where they have rubbed against each other or against the supports. Corrosion-fatigue cracking is generally recognized by small circumferential cracks varying in number from a few up to several hundred midway between the tube support sheets or a few inches from the tube sheet. Deep round pits may also develop in the same area.

Preventive Measures. Severe vibration of the tubes may exist without causing perceptible vibration of the shell. Dampening of excessive vibration can often be accomplished mechanically simply by wedging strips of wood or pieces of flattened tubing between the rows of tubes which are affected. Other measures may involve additional tube supports. In some cases, excessive vibration has been reduced by avoiding critical operating velocities of turbines, pumps, motors and similar equipment and correcting any conditions which interfere with the smooth operation of such equipment.

Laboratory Service. Corrosion research is an important function of Bridgeport's laboratory. Experience gained from years of research, field and service tests, and from working closely with operators is of much value in helping solve your tube problems.

Bridgeport manufactures many corrosion resisting condenser and heat exchanger tube alloys for use in the chemical, petro-chemical, refining and power plant fields. Duplex Tubing is supplied in such combinations as Admiralty, Muntz, Aluminum Brass, Duronze° IV (Aluminum Bronze), or Cupro Nickel on one side with steel, stainless, aluminum, monel, or nickel on the other side.

Contact the nearest Bridgeport office for service and write for the 120-page Condenser Tube Manual, containing corrosion data, suggestions for increasing tube life, information on tube alloys, methods of installing, specifications, etc.

°Reg. U. S. Pat. Off. No. 2093380

• • •

"Bridgeport"

BRIDGEPORT BRASS COMPANY

BRIDGEPORT 2, CONN • *Established 1865*

Mills at Bridgeport, Connecticut, and Indianapolis, Indiana
In Canada—Noranda Copper and Brass Limited, Montreal

CONDENSER AND HEAT EXCHANGER TUBING





the right filter base

● If you choose the wrong filter base, improper filtration and higher costs may result. Sperry's expert engineers, on the other hand, will study your particular problem and recommend the filter base to do your filtration job right.

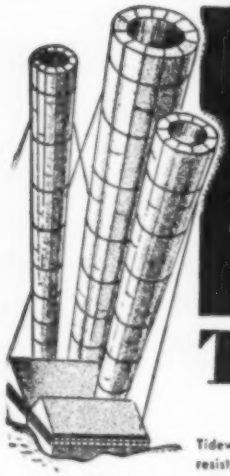
Sperry supplies a complete line of filter bases, too . . . in paper, cloth, vinyon, asbestos, rubber and woven metals, as well as special bases for special requirements.

Call on Sperry for a complete analysis of your problem. We'll specify the right filter base for more efficient and economical filtration. There's no obligation.

D. R. SPERRY & COMPANY, *BATAVIA, ILLINOIS*

Filter Base Division

SPERRY
FILTER BASES



A WOOD
Naturally Resistant
TO ACIDS, ALKALIES AND DECAY

Tidewater
RED CYPRESS

Tidewater Red Cypress serves better and lasts longer. It's natural resistance to acids, alkalies, etc. insures long and satisfactory results when used in vent stacks, pickling troughs, electroplating vats, etc. It's use under these conditions truly confirms its claim to being "The Wood Eternal".

If you have a particularly perplexing problem let us help you solve it. We invite inquiries concerning all types of tanks and vats . . . fully fabricated or partially fabricated.

The Wood Eternal — Red Cypress

FLEISHEL LUMBER COMPANY

4232 Duncan Ave., St. Louis 19, Mo., NEwstead 2100

turn, is produced catalytically from diisobutylene, carbon monoxide and hydrogen by the Oxo process.

THE SIX organic chemicals are nonanoic acid, nonylamine, nonyl aldehyde cyanohydrin, alphahydroxydecanoic acid, octadecenyl aldehyde and octadecyl alcohol. Possible applications for these chemicals are as plasticizers, wetting agents, polymers, rubber chemicals, lubricants, solvents and textile chemicals. When Rohm & Haas has evaluated the markets for its new products, it will proceed to plans for plant construction and large-scale manufacture.

Phillips Starts Ammonium Sulphate Unit at Houston

OPERATION of the partially completed ammonium sulphate plant of Phillips Chemical Co. at Port Adams, Houston, Tex., began last month. About 150 employees are now working in the operation of the plant, and it is expected that 200 people will be employed when it is completed.

Completion of plant construction and full scale production is scheduled for the latter part of this month. Chemical Construction Corp. is in charge of plant construction.

Brown and Root, Inc., is deepening the slip in the plant's marine area on the Houston Ship Cannel.

Gulf Chemical Starts Phosphate Production at Houston

A NEW FIRM, Gulf Chemical Co. has put into production its new $1.5 million plant at Houston for the manufacture of phosphoric acid and a line of sodium and calcium phosphates. Florida phosphate rock is the starting point for the products, which are designed for use in the food industry, livestock feed, liquid fertilizers, washing powders and soaps plastics, textiles and petroleum production.

Gulf is a new organization and is Houston-owned. Officials include George A. Butler, president; Otto Schoenfeld, executive vice president and general manager; Clayton N. Smith, vice president; Cecil A. Cook, secretary; J. M. Sheesly, treasurer.

Koppers Pittsburgh Formed To Run Phthalic Unit

Koppers Co., Inc., and Pittsburgh Plate Glass Co. have announced that Koppers Pittsburgh Co., a new Delaware corporation in which each owns 50 percent of the outstanding stock, has taken title to the phthalic



XRD-3B—*the basic unit*
XRD-3F—*for film technics*
XRD-3S—*the x-ray spectrometer*
XRD-3D—*for direct measurement*

Analyze directly with the XRD-3!

Go beyond the microscope. Dig down into the fundamental structure of matter. Find the atomic positions, ionic groupings and crystallographic systems of substances. And do it economically – with the XRD-3.

Whether you are working with metals or metal alloys . . . ores, clays and other mineral structures . . . paints and pigments . . . ceramics and glass . . . cement and plaster . . . textiles and fibers . . . or rubber and allied products . . . you'll get more information – faster – with the XRD-3. Here's why!

You are sure. You get G-E accuracy in the XRD-3. Latched ma and high-voltage positions reproduce settings accurately for long series of experiments. Exposure timer is correct to within 60 seconds in a twenty-hour range. X-ray intensity is constant; plus or minus ½ per cent. Resolution of diffraction data is optimum—for powder data, 0.02 degree maximum.

You are completely equipped. There are available for use with the basic XRD-3 components which make possible (1) the direct measurement of diffracted intensities, (2) the direct measurement of fluorescent x-ray spectra, (3) all film technics. All XRD cameras and many others fit the standard diffraction instrument support. The clear flat top around and under the tube makes the adaption of other cameras simple.

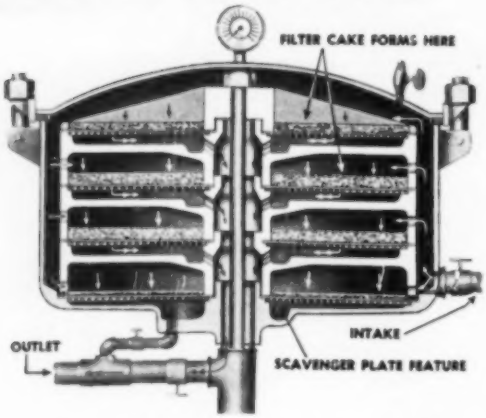
You are seated. You work at a desk-type console. All meters and controls are within easy reach. You read spectrogoniometer angles from stationary indicators without your leaving your chair. Controls, transformer *and* water cooler are *within* the console.

FREE—The story of the most modern of diffraction devices—the XRD-3. Write General Electric X-Ray Corporation, Dept. B-5, 4855 W. McGeoch Ave., Milwaukee 14, Wisc.

GENERAL ELECTRIC
X-RAY CORPORATION

General Electric X-Ray Corporation manufactures and distributes x-ray apparatus for industrial, dental and medical use; electromedical apparatus; x-ray and electromedical supplies and accessories.

SPARKLER
horizontal plate
FILTERS



. . . are efficient and reliable in the process of solvent recovery

In Sparkler Horizontal Plate Filters the filter cake rests flat on the supporting metal plate without tensile or distortive strain. In this position the cake will not crack under pressure and complete dependable filtration is assured.

Practically every kind of liquid from light alcohols to heavy rosins can be filtered in a Sparkler Filter. Filters can be designed and constructed for any particular type of fluid to be filtered. Steam jacketed models where required and brine jacketed models when cooling is necessary. Tanks and working parts are made in a range of materials including stainless steel, mild steel, bronze, nickel, monel, or rubber lined steel. Explosion proof motor equipment used when required. Filter plates are available in two depths, deep plates for liquids carrying a large percentage of solids; shallow plates for liquids carrying only a small percentage of solids, the latter providing a larger filtering area within the same size tank.

Sparkler Filters are equally efficient for continuous or intermittent operation. Complete recovery of product is obtained by "wash through" or "blowdown" of cake without removal from filter. The Sparkler patented scavenger plate acts as an auxiliary filter with independent control valve, filtering each batch down to the "last drop", leaving no hold-over.

Sparkler Horizontal Plate Filters are made in a range of sizes from the small laboratory pilot plant models to the standard plate models of 50 G.P.H. to 5000 G.P.H.

Our engineers are ready to cooperate in solving any problem of filtration. Write R. S. Lipp, Industrial Sales Dep't.



In the recovery of naphtha and benzol solvents at the Bayer Aspirin plant Sparkler Horizontal Plate Filters are installed in the processing line.

SPARKLER *horizontal plate* FILTERS

SPARKLER MANUFACTURING COMPANY, Mundelein, Illinois

anhydride plant at Kobuta, O., (across the Ohio River from Beaver, Pa.) Officers of the new firm, which makes a product used in the manufacture of paints, varnishes, lacquers, and as a plasticizer, are: E. D. Griffin, chairman of the board; Dan M. Rugg, president, Paul R. Croll and B. J. C. Van der Hoeven, vice presidents; C. R. Fay, comptroller and treasurer, and E. S. Ruffin, Jr., secretary.

Refractories Studied Under ARI Graduate Study Plan

In the interest of furthering the training of technologists for the refractories industry, the American Refractories Institute has sponsored fellowships for worthy graduate students who are interested in the study of problems relating to refractory materials. Eight fellowships on refractories have been established at universities having ceramic departments.

Pacific Chemical Exposition Scheduled for November

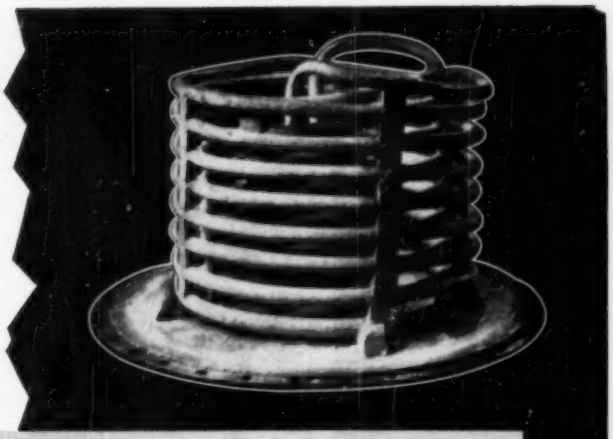
Date for the second Pacific Chemical Exposition by the California Section of the American Chemical Society for 1949 has been set for November 1-5, at the San Francisco Civic Auditorium.

As in 1947, the Pacific Industrial Conference will run concurrently with the Pacific Chemical Exposition. These one- and two-day conferences of the 12 cooperating national and local societies and associations provided one of the most outstanding over-all conference programs ever given in the West, and it is expected that an even finer program will be assembled for the 1949 Conference.

Money for New Laws Put in Budget

The budget presented by President Truman to Congress at the beginning of January included proposed appropriations for activities which have not yet been authorized by law. Considerable industrial confusion has followed. For example, many persons have thought that National Science Foundation must have been set up already, or must be about to come into existence, because $2 million are included for that prospective agency in the President's recommendations.

That is only one of about 45 such "possible" items of appropriation totaling altogether $6.17 billion. No one who really knows Washington expects that all of this large number of projects will soon be established, even



Tantalum is a PROFIT TOOL

Instance—

Fansteel
Tantalum Coil
vs.
Lead Coil



The tantalum coil at the right was designed for the same work as the base metal coil above—boiling a mixture of sulphuric and hydrochloric acids.

The heating area of the tantalum coil is only 1/18th that of the base metal coil.

Because tantalum withstands higher steam pressures, reaction time is shortened and production is increased by one-third.

And the tantalum coil is permanent—with long freedom from repair or replacement. Figures and other details are available.

Executives and chemical engineers are invited to write for an informative book "The Metal Tantalum." Fansteel Metallurgical Corporation, North Chicago, Illinois.

Among those who can use tantalum equipment profitably:

Users of chlorine, for heat exchangers, coils, absorbers, condensers, spargers, flexible pipe connectors, small agitators.

Users of hydrochloric acid, for heat exchangers, coils, condensers.

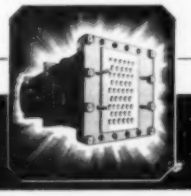
Producers of bromine or hydrobromic acid for condensers or purifiers. Bromine users for heat exchangers, condensers, small specialties of piping and agitators.

Users of nitric acid, heat exchangers, particularly of multiple bayonet type. Here tantalum conspicuously excels.

Some users of sulphuric acid who recover and reconcentrate the acid —heat exchangers.

USE TANTALUM WITH ECONOMY for most acid solutions and corrosive gases or vapors, except HF, alkalis or substances containing free SO_3.

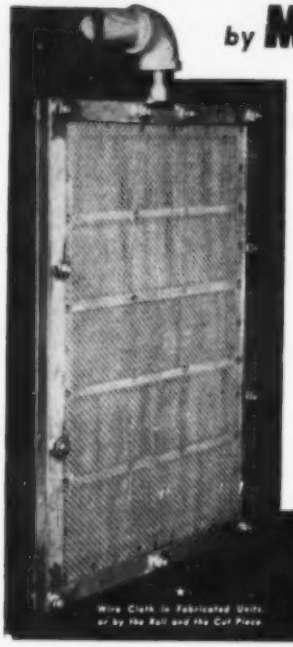
11402



Fansteel

Acid-Proof
TANTALUM
CHEMICAL PLANT EQUIPMENT

FILTER CLOTH UNITS
by MULTI-METAL



The all-stainless steel filter leaf shown represents one of hundreds of styles regularly fabricated in the large, modern Multi-Metal plant.

34 years of specialization have made Multi-Metal leaders in the field of wire cloth fabrication and all the resources of a large, well-established concern are yours when you put your filter leaf problems in Multi-Metal's hands.

Send for catalog and free wire cloth samples.

Always in stock — wire and filter cloth of all meshes, weaves, and metals. Order by the yard or piece.

Wire Cloth
Filter Cloth
All Meshes
All Metals

Wire Cloth in Fabricated Units or by the Roll and the Cut Piece

Multi-Metal
WIRE CLOTH COMPANY, INC.
1350 Garrison Ave., New York 59, N. Y.

IMMERSION HEATING WITH VITREOSIL (Vitreous Silica) HEATERS



When other methods are unsatisfactory, acid solutions in tanks of any material can safely be heated by Vitreosil electric immersion heaters.

Send for Bulletin #2

VITREOUS SILICA — VITREOSIL

THE THERMAL SYNDICATE, LTD.
12 East 46th St. • New York 17, N. Y.

though the President says that all of them are so urgently needed as to make early appropriations for beginning action next July highly desirable in the public interest.

Those who wish to forecast legislative action, and most of us do, can usefully examine this particular part of the budget message. It appears to indicate those types of new legislative enactment which the Administration intends to press first in the Congress. But there is no reason to believe that anything like all of them will either be authorized or appropriated for before the beginning of the fiscal year next July, for which the budget proposes a fiscal program.

Lewis Emanuel Young Will Head AIME in 1949

ELECTION of Lewis Emanuel Young, of Pittsburgh, as president of the American Institute of Mining and Metallurgical Engineers for 1949 was announced at the meeting of the Board of Directors November 17. Dr. Young is a consulting mining engineer and has been vice president of the Pittsburgh Coal Co.

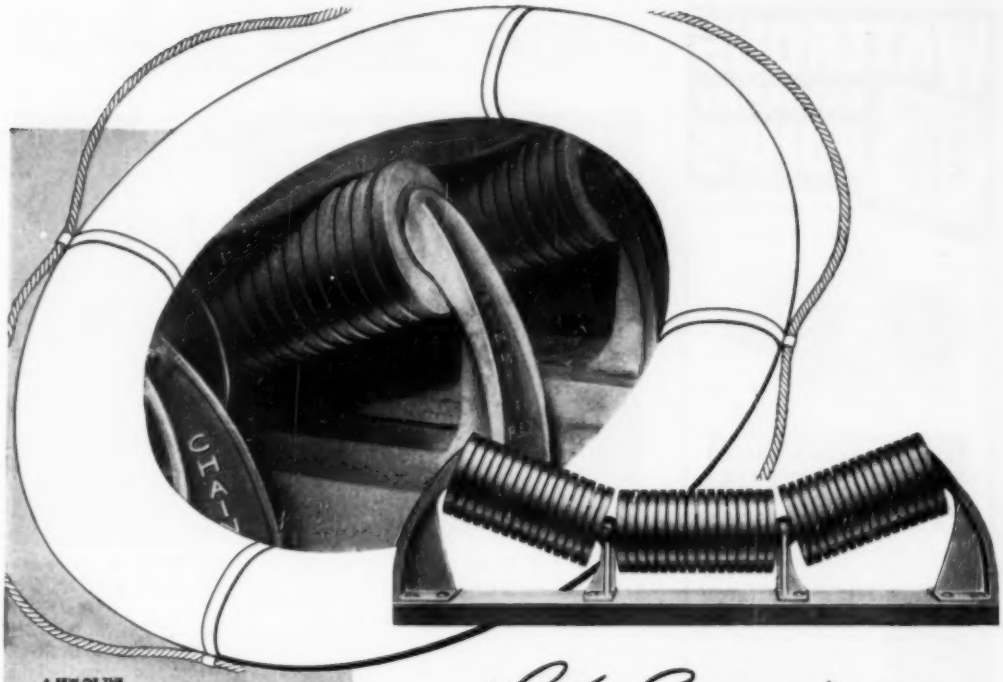
Announcement was also made of the election of two vice presidents: Augustus Braun Kinzel, president, Union Carbide and Carbon Research Laboratories, New York; and Philip Kraft, vice president, Newmont Mining Corp., New York.

Four new directors elected were: William J. Coulter, general manager, Climax Molybdenum Co., Denver; James L. Head, mining engineer, Anaconda Copper Mining Co., New York; W. M. Peirce, chief, research division, New Jersey Zinc Co., Palmerton, Pa.; and George P. Swift, consulting engineer, Waltham, Mass.

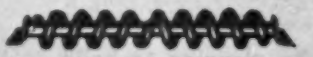
More Oil Extraction Due In Western Operation

IN LATE 1947, Western Solvents, Inc., was formed at Longmont, Colo., to process seed-oil crops—chiefly flax, safflower and castor beans. By last August construction was started on a commercial extraction unit which is now being completed. Design daily output will be some 35,000 lb. of oil and 35 tons of safflower oil cake and linseed meal. Expellers will be used at first, states President Albert M. Lane, but plans are being developed for a combination expeller and solvent extraction process.

In addition to the actual processing and marketing, Western Solvents is confronted with the problem of developing its own oilseed crops, of which



A FEW OF THE REX IDLER LINE



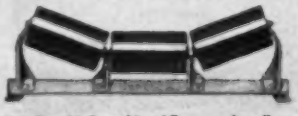
Rex No. 55 Rubber-Covered Spiral Return Idler . . . creates an ever-changing point of contact to keep moisture, ice, abrasive and sticky materials from building up on the belt.



Rex No. 33 Self-Aligning Troughing Idler . . . used at intervals to align belt where off-center loading, side-wind drifting and uneven stretch are problems.



Rex No. T-6 Flat Belt and No. T-1 Return Idlers . . . are dead shaft type idlers. They are equipped for high pressure grease lubrication . . . have hydraulic type fittings.



Rex No. 32 Troughing Idler . . . is roller-bearing equipped, can be furnished with steel or gray iron rolls. Has no shelves or pockets to catch dust . . . is self-cleaning.

A *"life Saver"* FOR YOUR CONVEYOR BELTS!

Here's a real "life saver" for your conveyor belts! Rex Impact Cushioning Idlers installed under the loading points will take the "bumps" for your belt . . . minimize ruptures and lacerations!

Rex Impact Cushioning Idlers are dual-purpose rubber rolls. These rolls are scientifically molded with (1) deep primary grooves for maximum cushioning . . . and (2) secondary grooves to provide surface softness to protect belt covers from laceration.

Here's deflection under impact! When otherwise damaging blows occur, there is momentary displacement of the rubber that absorbs the shock and cushions the impact force . . . and saves the life of your belt! There's plenty of support for Rex Impact Cushioning Idlers, too . . . heavy, unbreakable brackets on a steel channel base.

Rex Impact Cushioning Idler Rolls are pressed to the Rex Roller Bearing Assembly Tubes . . . the famous tube design that has been leading the field for over twenty-five years . . . with thousands of long-lived applications in almost every industry. For all the facts about these "life saving," belt saving idlers . . . write for Bulletin No. 463. Address Chain Belt Company, 1648 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT REX COMPANY BELT CONVEYOR IDLERS

WATEROUS SANITARY PUMPS

STAINLESS STEEL OR NICKEL ALLOY

100% Sanitary



for

PUMPING MANY TYPES OF CHEMICALS!

A modern advanced design in positive rotary pump, Waterous Sanitary Pumps with ball bearing construction assures long efficient service, on most all chemicals or products being pumped. Heavy duty precision ball bearings control radial and end thrust loads on shafts and rotors. Bearings and timing gears operate in oil for long life and quiet operation . . . no metal friction within the pumping chamber . . . double lobe rotor design assures perfect rotor balance and continuous liquid delivery.

Waterous Sanitary Pumps are self-priming, have accurate volume control and their slow pump speed eliminates agitation or aeration so that thin or viscous materials are pumped without agitation or aeration. Semi-solids can be pumped without crushing the material or jamming the pump. And, many abrasives may also be pumped.

Capacity of Waterous Sanitary Pumps is in direct proportion to the pump speed. Pump can be operated efficiently at speeds ranging from 50 to 600 r.p.m. . . . viscosity of material being pumped is the efficiency factor.

Check the features emphasized here and you'll see why chemical plants prefer Waterous Sanitary Pumps for high quality and efficient service that is backed by 81 continuous years of pump manufacturing.

POSITIVE ROTARY ACTION

MECHANICAL SEALS

SLOW SPEED ELIMINATES AGITATION

ACCURATE VOLUME CONTROL

CONTINUOUS FLOW

NO BEARING SURFACES IN PUMPING CHAMBERS

REVERSIBLE INTAKE DISCHARGE PORTS

Write for complete details to:

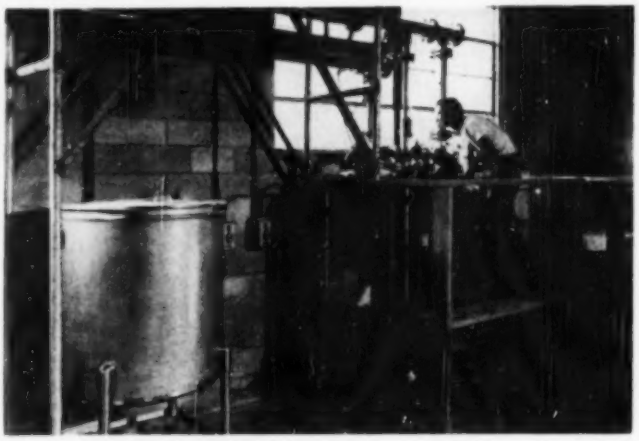
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St. Paul 1, Minn.

DESIGNED AND MANUFACTURED BY EXPERIENCED *Engineers*

Waterous Dependable

SINCE 1866

several thousand acres will be planted next season. Safflower is well suited to Colorado and western Nebraska's climatic conditions; it is expected to offer a wheat substitute to the great dry land areas of the plains.



GLASS-LINED STILL is equipped for refluxing or distillation at atmospheric pressure. It is part of Sterol's new processing equipment set-up at Los Angeles.

Sterol Starts Production of More Synthetic Medicinals

SEVEN more synthetic medicinals are now being made commercially in the West. The producer is Sterol Derivatives, Inc., Los Angeles; the products are progesterone, testosterone, mercurophylline, estrone (ketohy-

No matter what you're planning to build, chances are you can do it faster, easier and at lower cost



WITH



Luria buildings are *permanent*, heavy steel frame structures—easily adaptable to practically any building requirement. Yet they cost little or no more than lightweight temporary buildings. And they're *available now*—ready for prompt delivery!

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LEAD VALVES

Control Hungry Acids



Chem Rayon "Y" Pattern



Type C "Y" Pattern

Men who need to tame biting acids and put them to useful work have long relied on lead. And they look to the leader in lead . . . National Lead Company . . . for dependable lead and lead-lined acid valves.

National Lead's "United" valves work efficiently at their routine jobs of controlling the flow of corrosive acids. But they also have the built-in stamina and sturdiness to withstand stresses and overloads well beyond their regular lines of duty.



Wedge Type Gate Pattern

The "United" valve you buy is representative not only of National Lead's resources in the lead products manufacturing field but also of resourcefulness in designing acid valves that make the most of lead's inherent corrosion-resistant properties.



Type D Check



Chem Rayon Angle Pattern

Under the name "United," National Lead Company offers a complete line of hard lead and lead-lined flanged acid valves —"Y" and angle patterns, gate, check, foot and diaphragm.



Diaphragm Pattern



Type R Reversible-Angle or "Y"

Look to the Leader for Lead

. . . in everything from lead pipe . . . valves . . . sheet . . . and lead-lined or lead-covered equipment . . . to complete acid recovery plants.

NATIONAL Lead Company

New York 6; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Pittsburgh 13; St. Louis 1; Boston 6, (National Lead Company of Mass.); Los Angeles 23, (Morris P. Kirk & Son, Inc.); Philadelphia 25, (John T. Lewis & Bros. Co.); Atlanta (Georgia Lead Works, Div. of Cincinnati Branch); Toronto, Canada (Canada Metal Co. Ltd.).

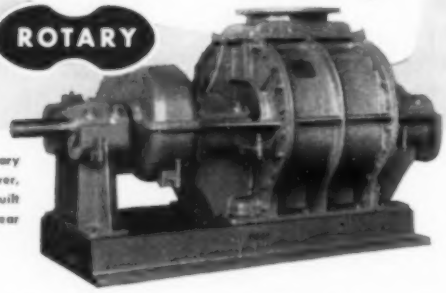


Battery of five R-C multi-stage, Centrifugal Gas Exhausters driven by steam turbines.

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ROTARY



Standard Rotary Positive Blower, Type RCD, built in 8" to 22" gear diameters.

With a wide choice of Centrifugal and Rotary Positive Blowers available, you can usually select standard R-C units to meet your specific applications. Capacities range from 10 CFM to 50,000 CFM or higher for special requirements. Roots-Connersville is the only blower manufacturer offering you this *dual choice*.

We're impartial as to drives, too. We supply them or you can utilize drives already available. Direct motor, speed changer or V-belt, steam turbine, gas engine or other modern types provide high-efficiency operation for R-C units. That's another phase of R-C *dual-ability*.

With R-C equipment on the job, you'll enjoy long-time, trouble-free performance. That's because of sound design and sturdy construction, based on 95 years of building gas and air handling equipment, *exclusively*. For any such problem, consult R-C *dual-ability*.

ROOTS-CONNERSVILLE BLOWER CORPORATION
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droxyestrin), estradiol, estradiol benzoate and ethinyl estradiol. The unit is the only one in the West making progesterone and testosterone, the only one in the country making the complete line of specialties. The products are distributed throughout the United States.

Foots from soybean oil is the raw material for progesterone and for testosterone. The sitosterol is first separated from the stigmasterol; both are then converted into the acetate dibromide. Oxidation of sitosterol acetate dibromide is done with chromic acid in 200-gal. glass-lined reactors the oxidation product is then processed into testosterone. Stigmasterol acetate dibromide is oxidized by ozone from a Welsbach generator that produces 100 g. of O_3 per hour and is fully automatic. The ozonized product is put through the Barbier-Wieland degradation and, after another oxidation, ends up as progesterone. In addition to the seven products already listed, the firm makes other low-unitage, high-cost fine organic chemicals used in pharmaceutical preparations.

President S. S. Carlat was once a partner and general manager of Bedwell Laboratories and Coast Chemical Co.; previous to that he was sales manager for Nopco Chemical Co. Vice-president E. Leon Foreman was formerly director of research for Lakeside Laboratories, Milwaukee.

New Aromatic Oil Distillation Plant Planned in Pennsylvania

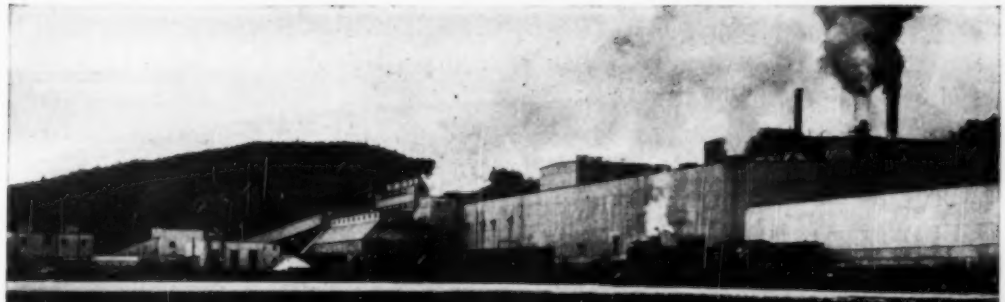
PLANS for a $1,000,000 distillation plant near West Elizabeth, Pa., have been announced by the Pennsylvania Industrial Chemical Corp., Clairton, Pa.

In about six months the firm expects to complete the installation of an entire distillation unit for the separation of precision fractions of aromatic oils.

Erection of the distillation unit is the first step proposed by Pennsylvania Industrial Chemical Corp. in its long-range expansion program for this area. The new plant will be an auxiliary to the Clairton operations, and will be operated by the Clairton organization.

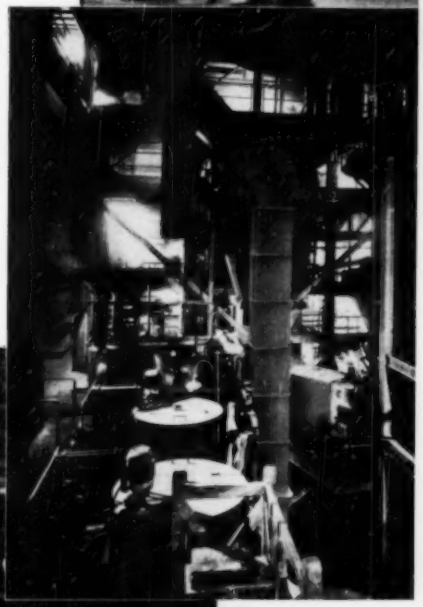
Statistical Methods and Corrosion Courses Given in Brooklyn

A NEW course, Statistical Treatment of Chemical Engineering Data, designed principally for practicing engineers and scientists, started January 31 at the Polytechnic Institute



. . . AS A SUPPLEMENTARY ORGANIZATION

To expedite the design and construction of a Pulp Mill for Marathon Paper Mills of Canada, Ltd., Stone & Webster Engineering Corporation established a supplementary organization of engineers, specialists and draftsmen to act as part of the client's own engineering department. The Engineering Corporation also furnished consulting advice on special phases of the project and supervised all the construction.





The Bleached Sulphate Pulp Mill of Marathon Paper Mills of Canada, Ltd., located at Marathon, Ontario, on the North Shore of Lake Superior.

Above: Power and Recovery Boiler Room. Left: Machine Room — Dry End.

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A SUBSIDIARY OF STONE & WEBSTER, INC.

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against Chemical hazards
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of Brooklyn. Cuthbert Daniel, senior chemical engineer of Hydrocarbon Research Inc., will present the course, the first of its kind given in an engineering college in the country, during the coming semester, it was announced by Dr. Donald F. Othmer, head of the department of chemical engineering. Mr. Daniel is a consulting statistician to several important companies in American industry. He introduced the statistical method of approach in handling the vast amount of data which had to be studied in the steps leading up to the production of the atomic bomb.

Dr. Alfred Chatenever, consulting engineer, will give a course during the spring semester on corrosion in the process industries, it was announced by Dr. Raymond E. Kirk, dean of the graduate school. The first session was held February 1.

According to Dr. Kirk, among the major losses of industry today is the corrosion of equipment of all types. The problems are so serious that many times corrosion aspects are the principal matters to be solved by the chemist and the engineer in the design of processes and in the building and operation of plants. The course has been designed to show the engineer and the chemist how to combat these losses.

Celanese Plans More Chemicals For Bishop Operations

The Celanese Corp. of America plans further expansion of the Chemcel plant at Bishop, Tex., this year. The company contemplates a large program for the manufacture of certain derivatives of formaldehyde, and new process equipment will be installed to this end. Additional chemicals which will probably be marketed commercially include propionaldehyde (made last year in drum quantities), *n*-butanol and iso-butanol.

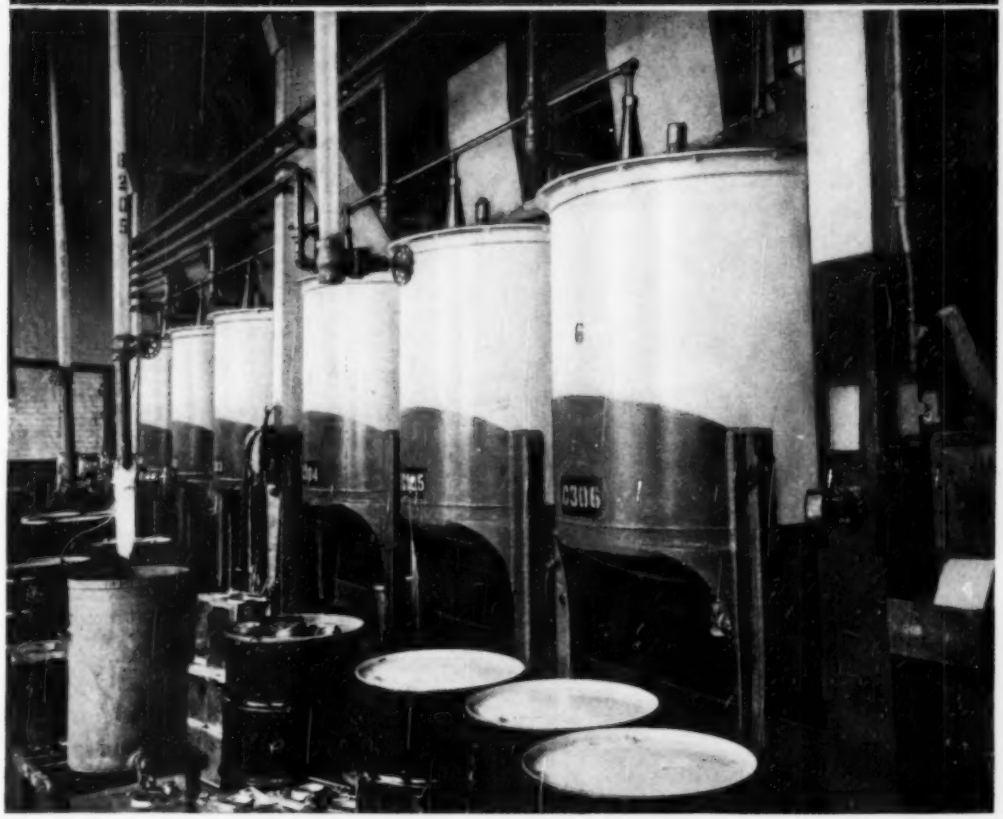
Last year Celanese entered the glycol field with the production of 2-methyl 1, 3-pentanediol. Other glycols are being investigated on a pilot plant scale in the research center at Clarkwood.

CORRECTION

Industrial Notes

Alloy Steel Products Co., Linden, N. J., has made H. E. Johnson sales manager with headquarters at Linden. He was formerly sales manager of the Chicago office. In the January issue of *Chemical Engineering* (p. 258) it was incorrectly stated that he was made sales manager of the Chicago office.

THIS USED TO BE A FIRE HAZARD



—BUT IT'S NOT ANY MORE

Years ago, a fire *did* start in one of the vats used in making protective coatings at a large lacquer plant. The blaze was quickly extinguished, without damage, by a 50-pound carbon dioxide (CO_2) wheeled unit.

But that fire convinced the plant management that things would be safer with built-in *automatic* fire protection. So they installed a *Kidde** system and gave it a 24-hour job to do. It's *always* ready to swoop down on fires in the 6 agitating vats shown, as well as in 7 mixing and 8 finished-product vats.

Because this *Kidde* system must guard three separate batteries of vats, automatic directional valves turn the CO_2 into the zone where fire's been spotted. And, as the CO_2 rushes along its path to the fire, it sets off pressure trips and switches that slam closed the open hatches on the vats, and shut down all machinery.

It's *all* automatic. An automatic *Kidde* extinguishing system never gets panicky, never does the wrong thing. Also, CO_2 won't dilute or contaminate materials in the vats.

That's just one instance, of course, of the thousands of tricky fire hazards protected by *Kidde* skill and equipment. *Whatever* your fire-protection problem, a Kidde representative can help you.

When you think of CO_2, call Kidde!

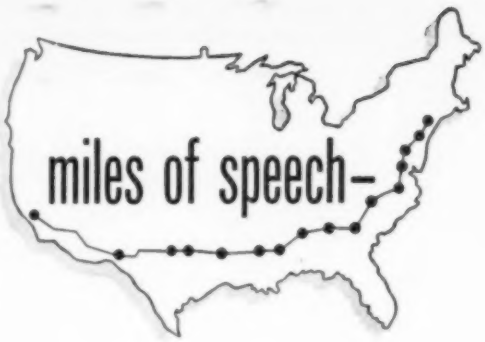
*Also known as "Lux"

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That's because the telephone system carries not sound itself but an electrical facsimile of sound. When you speak into a telephone transmitter your voice is converted into electrical vibrations which are not changed back into sound until they reach the receiver diaphragm.

Conversion of sound into its electrical equivalent, through the invention of the telephone, opened the way to the measurement of sound by accurate electrical methods. In developing means to make the telephone talk farther and sound clearer, the scientists of Bell Telephone Laboratories had to develop the tools for sound-wave analysis and measurement.

The condenser microphone, the wave filter, the amplifier — each the product of telephone research — have helped to reveal the structure of sound as never before. Each has helped to build the world's finest telephone system.

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NEWS FROM ABROAD

Special Correspondence

McGRAW-HILL World News

Solexol goes to South Africa . . . Red boring lags
Spain puts lid on uranium . . . Bolivia makes rubber deal
British trying to cut imports from U. S.

Kellogg Know-How Goes To South Africa

JOHANNESBURG—American know-how and South African enterprise have cooperated in establishing a fish oil refining plant using the Solexol process for the first time in the fishing industry anywhere in the world.

The Solexol process was developed by M. W. Kellogg Co. and the Marine Oil Refiners of Africa Ltd. at Simonstown, near Cape Town, is using it.

The process produces vitamin A concentrates from crude fish liver oils, and the plant can handle the Union's entire crude vitamin A oil production up to 12 million million international units a year.

The company can also process pilchard oil, which is used as a linseed oil substitute because of its high degree of unsaturation and in the manufacture of linoleum, varnish, waterproof cloths, patent leather, putty, sulphonated oils and printing inks. This latter plant was designed by the company's own technicians. A hydrogenation plant is to be installed to harden other refined marine oils into fats for edible oils, soap, margarine and shortenings.

Marine Oil Refiners of Africa Ltd. also obtained its plant in the United States and the sole license for Southern Africa. Its Solexol plant was process engineered and designed as an individual problem based on tests in New York on marine oils from South Africa.

Reds Trying To Improve Drilling Methods

Moscow—Soviet oil specialists associated with the Academy of Sciences' Petroleum Institute were recently told by M. A. Evseenko, Minister of the Oil Industry of the Eastern Regions of USSR, that "new methods of drilling" were essential if the industry was to meet output goals set by plan.

"With usual rotary drilling we cannot solve the oil output problems confronting us," Minister Evseenko said, adding "We must now drill wells at the rate of 200 to 400 meters, and perhaps even 1,000 meters (3,280 ft.) per day. The petroleum institute must give effective aid to oil workers in successful extraction of high-grade oils and high-octane fuels from eastern sulphurous oil."

Improvement in oil well drilling technique was also the theme of an open letter addressed to *Izvestia* by two prominent Soviet oil experts, N. Shatsov and Y. Kershenbaum, who called attention to the importance of drill bits, saying that research in bits was lagging, and this was a factor holding back the speed of drilling. The letter pointed out that well drillers had at their disposal only three types of bits, whereas the hardness and abrazive character of rock that had to be drilled through at oil and gas deposits varied immensely.

Noting that no single Soviet research institute was doing a rounded job of studying boring bits, and also the physical-mechanical properties of the rock to be drilled, the letter demanded the founding of an institute devoted to all-around study of boring bits as a means to more efficient and speedier drilling operations.

Spain Nationalizes Uranium Mineral Deposits

MADRID—All deposits of uranium and other radioactive minerals in Spain, Spanish Morocco, and Spanish colonies have been nationalized by government decree. The decree, which declared a national reserve over all deposits, prohibited exports of such minerals.

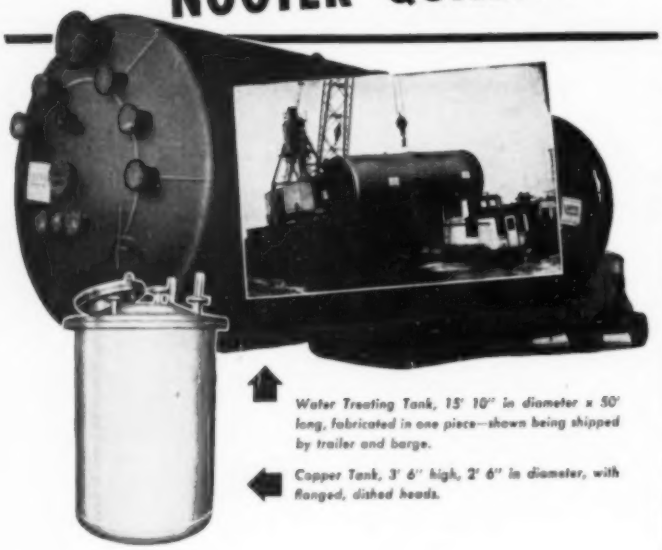
Canadians Hear Discussion Of Lignin Prospects

OTTAWA—According to Dr. R. A. V. Raff, research director of the Howard Smith Paper Mills Ltd., addressing the Science Association of the National Research Council here, the "lignin problem from its theoretical as well as practical angle still very much exists" and that "a satisfactory solution to the question of how to make profitable use of our vast lignin resources will come through fundamental research rather than by the



Toronto will be the site of this new Sharpe & Dohme (Canada), Ltd., plant.

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Water Treating Tank, 15' 10" in diameter x 50' long, fabricated in one piece—shown being shipped by trailer and barge.

Copper Tank, 3' 6" high, 2' 6" in diameter, with flanged, dished heads.

Whatever the size of your job—it pays you to count on Nooter for dependable highest quality fabrication. Step by step each job follows the same successful formula to attain the Nooter hallmarks of quality:

PURITY AND PRECISION—Complete adherence to detailed specifications insures structural exactness, efficient performance. Rigid inspection, including hydrostatic, pneumatic, and X-Ray assures safety and strength.

PERFECT FIT-UP—Engineers say they are always able to distinguish Nooter fabrications by the smooth, straight Nooter Dura-Pure seamwelds—placement of fillets, precise fit-up, and other distinctive Nooter features.

These advantages of Nooter craftsmanship are the result of the techniques and skills of the Nooter metallurgical specialists who guide and control each fabrication job. Their thorough background of technical knowledge of metals and alloys is your guarantee of unexcelled quality.

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so-called 'Edisonian' method of approach."

If and when a really profitable use for lignin has been established, Dr. Raff declared, the presently used chemical pulping methods may be entirely changed, possibly in the direction of a continuous extraction process with organic solvents.

"Now," he continued, "pulp mills are only interested in obtaining pulps of certain properties and in good yields. In future, they may also want to obtain optimal yields of lignin of a certain structure and uniformity and conforming to specified standards as well. These new and milder pulping methods may then, in turn, lead to better pulps in better yields, and to the simultaneous recovery of the other valuable constituents of wood now for the major part being burnt or going into the sewer, such as hemicelluloses, terpenes, rosins, fatty acids, waxes and tars."

British Firm Isolates Anti-Anemia Factor in Liver

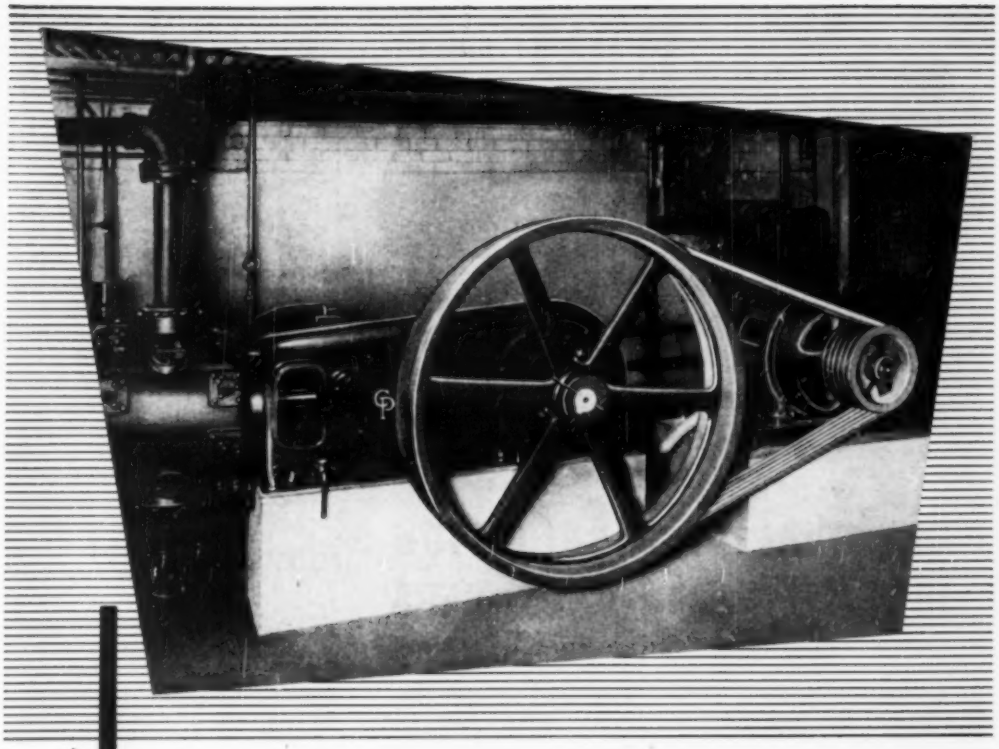
LONDON—Glaxo Laboratories, Ltd., claims to have succeeded in isolating from liver the anti-pernicious anemia factor in pure crystalline form and also to be producing enough streptomycin to meet Britain's present needs.

In his annual report, Sir Harry Jephcott, the chairman, states that from one ton of liver only a few grains of the substance can be extracted. "Work of this nature partakes of a fundamental character rather than a development which has immediate application," he says. "However, we now know the nature of this substance which has been elusive for so long, and, fortified by this knowledge, hope to be able in due course to make a further practical contribution to the treatment of pernicious anemia."

It is hoped to increase the output of streptomycin greatly in the months to come.

Italy Gets New Lastex Plant

GENOA—A new factory for the production of lastex began operations in December at Redona near Gergamo. The new plant is owned by the Pirelli-Revere and Societa Italo-American Filo Elastico, which is the combine originally set up in 1933 by the U. S. Rubber Co. and the Pirelli Tyre Co. The lastex, which is produced in 14 colors and 40 types, is being sold domestically as well as exported to Switzerland, Spain, Portugal, and South American countries. Major orders have been placed by the Argentine Jantzen fac-



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Simplate valves . . . liberally water-jacketed cylinder and heads . . . adjustable, tapered roller main bearings . . . double-counter-weighted crankshaft . . . are some of the CP features that have made it outstanding.

Type TB Compressor is furnished in sizes from 89 to 1937 c.f.m., with V-belt, flat belt, and direct-connected synchronous motor drive. Single and multi-stage designs for pressures up to 5,000 pounds, and steam-driven types are also available.

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tories. A factory similar to the Redona plant is now under construction in southern Italy. Output of this factory will be directed to export trade in the near east and India.

Shell and St-Gobain Form Petrochemical Unit

PARIS—St-Gobain Chemical Co. and Shell Oil have jointly formed a new company here which will manufacture chemical petroleum derivatives.

First fruits of this undertaking will be two new solvent factories on which construction is to begin soon. One of these factories will manufacture Teepol, a synthetic detergent which has been produced industrially in England since 1941.

Creation of the new company followed the recent forging of financial links between Shell Oil and the Raffineries de Berre, a St-Gobain affiliate. It illustrates the new interest being shown here in the manufacture of chemical petroleum derivatives. Several French companies are considering expanding their operations in this field.

Asia Chemical Planning Stresses Ammonium Sulphate

SYDNEY—Plans submitted by the United Nations Economic Commission for Asia and the Far East (ECAFE) at Sydney call for establishment of chemical industries in Japan's former Co-Prosperity Sphere (but not including Japan and Korea) at a cost of $934 million. This represents only 6.8 percent of the total projected expenditure on rehabilitation and development in the area. There is no indication yet in some countries where the necessary overseas capital, including $570 million for fertilizer plants, is to come from unless more attractive conditions are offered to private investors.

A survey by ECAFE officials discloses that in Burma, where destruction of oil refineries during the war was complete, production is not expected to be resumed before 1950. In Ceylon, the war-established quinine, glass, ceramics and acetic acid factories are now being operated at a loss. Steps are being taken to reorganize the industries on modern lines. Caustic soda production and vegetable oil hydrogenation are now under consideration.

China—most favored in the group with U. S. funds, but least able under present conditions to use them effectively—has announced several major chemical projects. These include a $5-million topping unit for the American-owned Shanghai Power Co., a $1½-million expansion of the Japanese-built Taiwan Fertilizer Co., the new $4-mil-

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Continental can supply you with improved Leverpak drums in any of seventeen eye-catching colors. We can reproduce your name and trademark in any of fourteen different inks. And there's no waiting for this service. We're set up to start the drums rolling your way as soon as you give us the word.

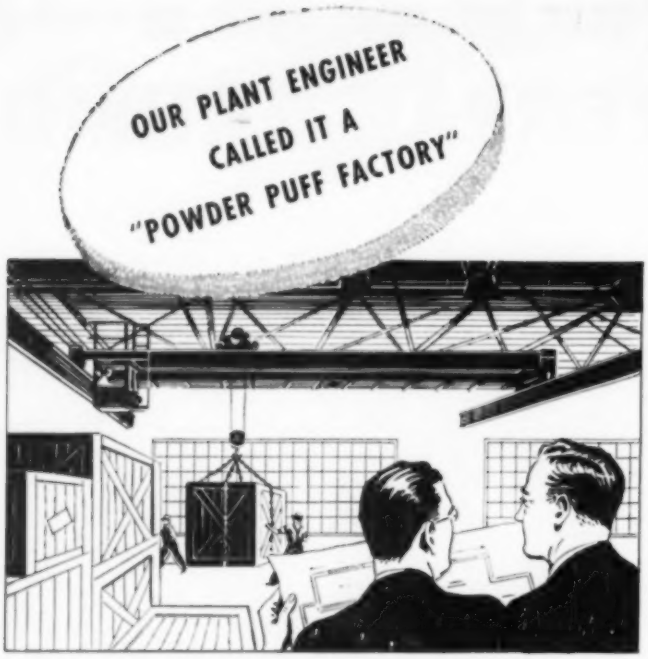
LEVERPAKS—unpainted or in colors—are the best-looking, most serviceable fibre shipping drums we have ever turned out. They load compactly and ride safely. The patented locking device is easy to open, easy to close. Metal chimes are flash butt welded for greater strength.

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"We liked the location and the size, but when we figured on increasing crane capacity, the structure just wouldn't take it. Our plant man finally gave up in disgust saying, 'They must have built this shop for a powder puff factory.' "

"When we decided to build, you can bet we planned *in advance* against the possibility of a future need for greater crane capacity."

"The Shepard Niles specialist was a great help in this planning. He seemed to know just about what loads were maximum in different types of industry. We were guided, to a great extent, by his suggestions."

The time to plan for most economical materials handling is before the building is built or the remodeling completed. Ask the Shepard Niles specialist to sit in—he has lots of experience behind him—and his sales interest is not concentrated on any one type of lifting tool.

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lion I-Min Fertlizer Co. in Formosa, and fertilizer plants at Keelung, Letung and Chinchui, all in Formosa. The $500,000 Yung Li Chemical Co. is to produce fertilizers at Nanking. Under an agreement with the Reynolds Metal Co., the Formosa aluminum industry is to be expanded. Work has started on a $5 million cement plant at Taiyeh.

India has plans to synthetize liquid hydrocarbons from coal and to extract sugar from palm. Aluminum production is to be stepped up. The government is building a large ammonium sulphate plant at Sindri, in Behar.

In Indonesia, emphasis is on fertilizers and on soap and margarine production.

In Malaya, the Unilever Co. has acquired a site for erection of a $4-million plant to produce soap, margarine and processed oils. This concern is also backing the Indonesian margarine project.

In the Philippines, a fertilizer plant (cost $14.4 million) is planned as part of a hydroelectric scheme. A small paper mill has started operations, and there are definite government plans to establish a newsprint mill and two wallboard plants.

In Siam, the manufacture of cement has been started.

Fertilizer

By and large, fertilizer production is to become the most important chemical industry in the ECAFE region as a whole. Stress is on ammonium sulphate, which has proved the most suitable nitrogenous fertilizer for tropical and sub-tropical farming conditions.

The present capacity of 100,000 metric tons a year, shared mainly by India and China, is to be stepped up to 1,050,000 tons under short-term plans in operation in various countries of the region.

Annual minimum requirements for this fertilizer have been set at 2,000,000 metric tons, equivalent in terms of nitrogen content to 400,000 tons. In addition, 1,000,000 metric tons of calcium superphosphate will be needed, equivalent to 160,000 tons of P_2O_5.

The total available supply of nitrogenous fertilizers at present, from internal production and imports, is estimated at 121,425 tons in terms of nitrogen content. There is thus a deficit of nearly 279,000 tons of nitrogen. The available supply of calcium superphosphate is estimated at 60,000 metric tons (9,600 tons of P_2O_5). Though the requirements are insignificant compared with such phosphorus-starved countries as Australia, New Zealand and South Africa, there is still a considerable deficit to be made up.

In China, the total chemical fertilizer requirements have been set at

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takes the headache out of milk of lime supply

If you use more than 5 tons of CaO per day for neutralization of plant water, plant waste or for any process requirement, the Dorrco Slaker is your answer for a trouble-free, continuous lime slaking station. Both slaking and grit removal are carried out in this compact unit which handles the complete slaking problem cleanly and efficiently.

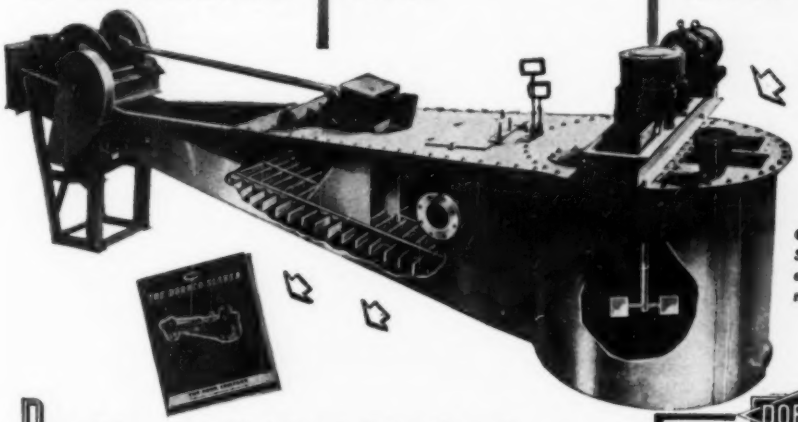
1 HIGH EFFICIENCIES... Large unit capacity because of tank design and rapid hydration because of mechanical agitation add up to maximum overall efficiency. In the classifier section, settling conditions are ideal and positive means for washing and removing grit are provided.

2 LOW INSTALLATION COST... The self-contained Dorrco Slaker is shipped almost completely assembled, ready to be bolted to the floor or to a simple concrete slab foundation. Erection is easy . . . no field welding . . . no costly piping or launders to connect Slaker and Classifier.

3 LOW MAINTENANCE COST... Replaceable 1" thick white iron liners on the sides and bottom of the Slaker tank will withstand abrasive action of lime for years. If needed, eventual replacements are inexpensive. All bearings are above solution level—accessible for lubrication.

4 NEAT, COMPACT INSTALLATION... The Dorrco Slaker eliminates the usual unsightliness of the lime slaking operation. No troublesome seals to construct . . . no piping or connecting troughs. It is readily ventilated and is designed to minimize operating hazards.

5 OPERATING SIMPLICITY... Minimum operating attention is required. Necessary only for operator to check periodically the rate of lime and water addition. Control instruments are available to reduce operating attention still further to that of occasional observation.



Cut-away view of Dorrco Slaker. Classifier section at left, Slaking Compartment at right.

Dorrco Slakers are available in 6 standard sizes with capacities ranging from 5 to 200 tons of CaO per 24 hours. Write for Bulletin #7281 for complete information.

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Manufacturing Engineers
MUNCY PENNSYLVANIA

66

500,000 tons in 1949, 700,000 tons in 1950 and 1,000,000 tons in 1951. Total consumption from local production and imports in 1947 was estimated at 245,000 tons. Domestic production in 1948 was estimated at 65,000 tons.

In India, the minimum requirements are 335,000 tons per year for the next three years. Total available supplies for the year 1947-48 amounted to only 125,000 tons from local production and 142,704 tons from imports.

The position in terms of supplies of elemental nitrogen was summed up as follows in a joint ECAFE-FAO report presented at the Australian conference:

Nitrogen Fertilizer Supply in ECAFE Countries

(Metric Tons of N)

	Domestic Production	Imports	Total Supply
Prewar	23,650	96,950	120,600
1947-48	12,610	79,906	92,516
1948-49 (Est.)	28,425	93,000	121,425

Technically, the most outstanding project is the government plant at Sindri, in India. Ammonium sulphate will be synthetized here from coke and gypsum.

Canada Finds Wage Rate Moves Higher in 1948

OTTAWA—The latest nation-wide survey by the Canadian Government reveals that the average weekly salaries and wages paid in the chemical and allied products manufacturing industries amounted to $1,953,348 on Oct. 1, 1948, and the average weekly salaries and wages reached $45.63 on the same date compared with $40.89 on Oct. 1, 1947, with the average hours per week reported at Oct. 1, 1948, being 43.8 as against 43.4 on Oct. 1 of the previous year and the average hourly earnings being 94.5c. and 84.2c. on Oct. 1 of 1948 and 1947 respectively.

Employment indexes in these industries stood at 97.5 and 92.6 on Oct. 1 of 1948 and 1947 respectively, and payrolls at 164.8 and 140.5 on these same dates respectively, on the base of June 1, 1941, being equal to 100.

Men comprised 75.9 percent and women 24.1 percent of the persons employed on Oct. 1, 1948, whereas on the same date of the preceding year men made up 75 percent and women 25 percent.

Bolivia Works Out Rubber Deal With British and French Firms

LA PAZ—Bolivian rubber producers have worked out an agreement with British and French tire manufacturers wherein raw rubber will be exported in

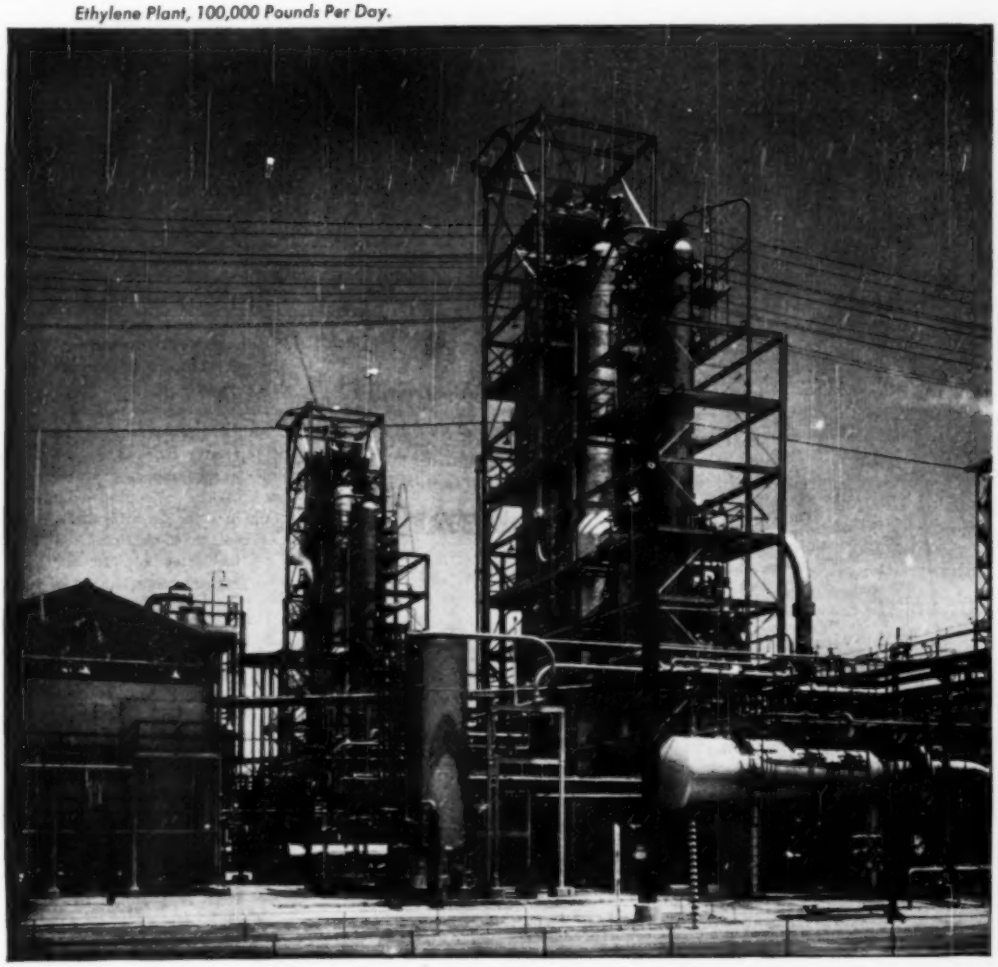
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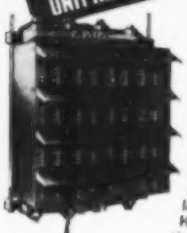


WITH YOUR MAINTENANCE MAN — AND FIND OUT JUST WHAT YOUR UNIT HEATING SYSTEM IS COSTING YOU!

- In down time due to inefficient operation of your unit heating system.
- In higher fuel cost due to heating that portion of your plant *not* in the working zone.
- In repairs to the units due to leaks, breakdowns or heating failures, caused by corrosion.
- In failure of units due to their not being capable of standing high steam pressure.

These are just a few of the items of expense you may find—if you are operating unit heaters of other design and construction than GRID. Avoid this needless expense.

INVESTIGATE GRID CAST IRON CONSTRUCTION UNIT HEATERS



GRID Unit Heaters are designed and made to eliminate maintenance while at the same time saving fuel cost, because they provide heat where it is most needed —to the working zone. They eliminate stratification of warm air at ceiling level . . . GRID Unit Heaters are designed for low outlet temperatures and more air delivery to the floor line —not the ceiling. Don't be confused by unit heaters with great BTU delivery and high outlet temperatures. BTU in a unit heater does not mean everything . . . it's the CFM and low outlet temperature that really count.

GRID heating sections are ONE piece construction high test cast iron—the metal for permanency . . . no electrolysis to cause corrosion, breakdown, leaks, heating failures, because there are no dissimilar metals used in GRID construction . . . no maintenance expense — but years of trouble-free heating service.

Write for complete catalog, CUH-846-CE, capacity tables and engineering data.

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exchange for an equivalent import value in finished ready-for-market tires.

Under the agreement, to run one year, and subject to renewal at prevailing rubber prices, Bolivia will export annually 1,000 tons of rubber to Dunlop Rubber of England and 500 tons to Manufacture de Caoutchuc Michelin of France.

The established price was 47c. per kilo fob. Manaos, Brazil. Bolivian government officials point out that the world rubber price is approximately 31c. per kilo, and that the agreement will help prop up the country's economy by another $755,000.

Unsuccessful bidders in the deal were International B. F. Goodrich, the Mohawk Rubber Co. of U. S., and the Corporacion Peruana del Amazonas.

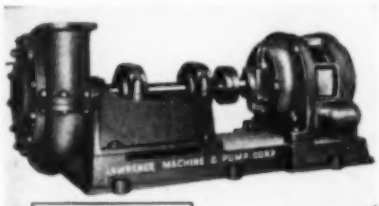
Bolivians expect the new agreement to help vitalize the isolated rubber fields at the Oriente Boliviana. Principal producers (annual capacity) are: Suarez Hnos, 1,000 tons; Seiler & Co., 700; Sonnenshein Hnos, 300; Octavio Reiss, 200; Fong Sui, 150; Barvia & Co., 100 tons.

British Plan to Make Enough Organic Chemicals by 1952 to Push United States Imports Far Below Present Levels

LONDON—Further details have been released on British chemical investment plans for the next four years. They will serve two major objectives—righting the balance of payments and increasing industrial production generally. Major extensions are intended in the organic chemicals, plastics, dyestuffs and basic chemicals (alkalis) divisions. The shortages in a large number of petroleum chemicals are to be made good, thus putting the organic chemicals industry into a more balanced state, for hitherto it has been self supporting only in coal tar products and relied on fermentation of molasses as the only really important source of ethyl alcohol.

Chemical exports are to reach by 1952 a level 90 percent above that of 1938. In fact this export figure was, according to earlier estimates, to be attained by the end of 1949. It thus appears that the government does not bank on any further marked expansion of chemical exports in 1950-1952. On the other hand, it hopes that the current dollar expenditures of over $60,-

How to CUT THE COST OF PUMPING An Abrasive Crystal SLURRY



In this installation wear was unavoidable. To keep costs down wear had to be minimized, so Lawrence engineers designed a replaceable lining of extremely hard alloy. The impeller was made of the same material. The horizontally-split construction permits quick, easy removal of the lining and facilitates repairs and replacements. The net result is low cost pumping. This same method can be adapted to the handling of any highly abrasive sludge, slurry, or mixture. We'll be glad to discuss it with you — without obligation.

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An informative bulletin describes HOW the Research Corporation Cottrell can bring about important savings for you. Write today for your copy.

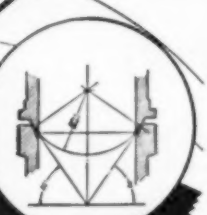
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. . . even when the pipe is not perfectly aligned!

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STANDARD AND DOUBLE EXTRA HEAVY

HOT FORGED from solid, rectangular steel bars, Catawissa Pipe Unions are free from sand and blow holes. The ball-to-angle seat design plus their ability to expand and contract with the pipe give you sure fire dependability . . . a perfect seal for every application!

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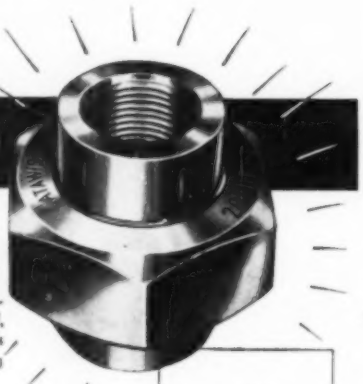
STAINLESS STEEL UNIONS

a type for every use!

MACHINED FROM SOLID STAINLESS STEEL BARS

Types 304, 316 and 347

Wherever caustic solutions are piped, Catawissa pipe union dependability is now available in corrosion-resisting Stainless Steel!



You specify the use and application. Catawissa will furnish a Stainless Steel Union recommended and guaranteed to give satisfaction! Standard and Double Extra Heavy types carried in stock. Specials made to order for socket welding, orifice plate, male-female or any other special use required!

U. S. Standard V-Threads in Union nuts and on female end.

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000,000 a year for the import of organic chemicals will be almost eliminated and that, a surplus for export will become available to enable sterling area countries to reduce their purchases of essential chemicals from North America.

The British plastics industry is to make up the leeway lost during the war and by 1952 raise its output to three times the 1938 amount. New urea and polyvinyl chloride factories will come into production within the next two years and most plastics imports are to be rendered superfluous in the next three years. The dyestuffs industry is to spend $40,000,000 to $50,000,000 on new capacity, especially for the newer and faster dyestuffs which must still be imported from continental Europe. By 1952 the British dyestuffs output is to be about 30 percent higher than in 1947.

Petrochemicals

The oil refining program provides for a crude throughput of over 8,000,000 long tons by 1950 and nearly 20,000,000 tons in 1952-53, compared with no more than 2,500,000 tons in 1947. Refinery expansion has already begun at Shell Haven, Stanlow and Llandarcy, and the proposed extensions at Fawley and Grangemouth should be well in hand by 1950. Another new refinery is planned in the South of England. Petroleum chemicals plant now under construction or consideration will thus not be held up by shortage of raw materials, though its development will necessarily be gradual.

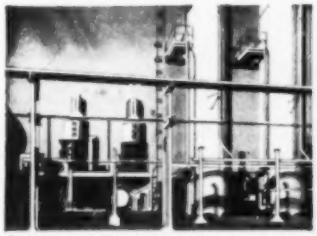
As regards organic chemicals, new plant has been designed for sulphuric and phosphoric acid, sodium compounds, superphosphates and other chemicals. The nitrogen industry is expected to continue to work at full capacity but will not be extended because the world shortage is likely to be overcome by expansion plans in other countries. The production of superphosphates will be raised slightly by construction of new plant, most of it to be completed by the middle of 1950. The output capacity for soda ash is being increased by 40 percent over 1947 and caustic soda output will be raised 80 percent.

The increased alkali capacity will enable the sterling area from now onwards to increase exports of soda ash and caustic soda to South America and the Far East, though it will be some years before the new plant comes into full operation. An expansion of exports is also anticipated in the case of plastics, dyestuffs and organic chemicals generally. But it would seem that, although the desirability of closer cooperation with other European countries is being realized, Britain's chemical industry does not expect to be able

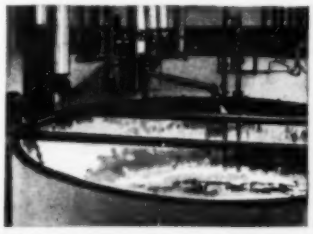
Are Your Corrosion Problems As Severe As These?



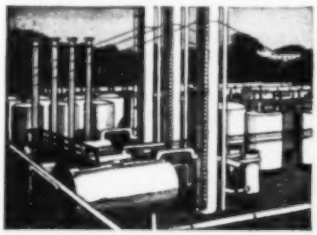
You won't be discouraged by any corrosion problem, when you read how these four companies have finally controlled extremely severe corrosion in their plants with a system of UCILON Protective Coatings!



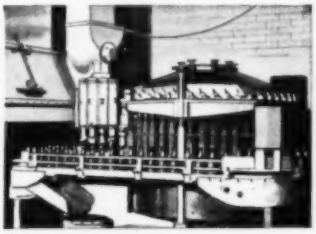
1. A WELL KNOWN REFINERY had Ucilon coatings applied to ducts exhausting oil and gasoline fumes at the cracking tower. One year after application, there was still not a sign of failure, despite the severity of the service.



2. A SOAP PLANT had a tough ceiling maintenance problem—some ordinary paints being destroyed by fatty acid vapors in as little as 2 weeks. Yet after *6 months* of exposure, Ucilon coatings were still totally unaffected!



3. A CHEMICAL PROCESSOR coated a steel storage tank with a Ucilon coating system. Especially hard on protective coatings, the tank's contents broke down two other coatings tried—one in 6 weeks. Yet Ucilon is still in good condition after *14 months!*



4. IN THE BOTTLING ROOM of one company, painting of machines was considered to be almost useless—until they discovered Ucilon. Nothing ever tried even approaches the effectiveness of Ucilon, which for *2 years* has been withstanding the humidity and spillage!



UCILON* 400

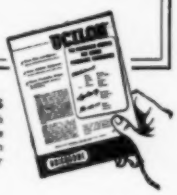
Ucilon 400 is a flexible, glossy, air-drying coating for metal, concrete and wood. It is applied by brushing or spraying. When solvents evaporate, a tough "plastic" film is formed. Ucilon 400 provides exceptional resistance to acids, alkalies, alcohols, oils and greases, salts, water, cleaning compounds, oxidizing agents.

OTHER UCILON COATINGS

Ucilon 1601—a ready-mixed, extra-bright aluminum paint with exceptional outdoor resistance. It stays bright under prolonged exposure, withstands elevated temperatures.

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Ucilon 1501—a very hard, chip-resistant baking coating which resists chemical attack at temperatures higher than recommended for Ucilon 400.



SEND FOR THIS BULLETIN *which gives more details on various Ucilon coatings and their properties.*

Similar reports continue to arrive from plants of every nature. Maintenance men are discovering a degree of corrosion protection and service life they never achieved with any coating tried before. If *you* have an exceptionally tough coating problem, we're confident that there's a Ucilon coating system to help you stop corrosion damage and vastly lengthen the period between your paint jobs. Let us send you our specific recommendations without obligation. Write today, outlining the details of your application.

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UCILON Protective Coatings

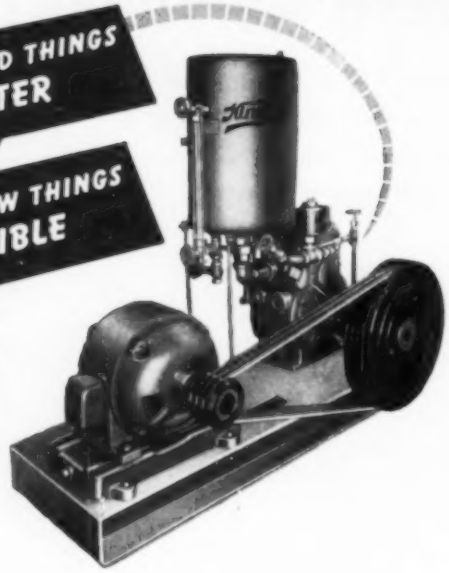
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Low pressure processing with Kinney High Vacuum Pumps has made possible the large-scale production of many of today's wonder products.

Whether your vacuum requirements are measured in *inches* or *microns*, look to Kinney for reliable low pressure performance. Kinney Single Stage Vacuum Pumps will produce low absolute pressures to 10 microns or better; Compound Pumps to 0.5 micron or better.

Write for Bulletin V45.

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to increase substantially its sales in these nearby markets.

While these plans are maturing, the government intends to hold an inquiry into the British chemical industry with special reference to its long term plans, its probable lines of development and the steps regarded as necessary to meet its objectives. As a first step, the Association of British Chemical Manufacturers has been asked to prepare a report, while the Trades Union Congress has also been consulted. The report will be produced by the middle of 1949 and be the basis for further consultation before any decisions on policy are made.

Market Condition

Meanwhile British chemical markets have entered the new year in a firm mood, especially as regards home trade. The flow of export orders seems to be somewhat affected at present by import license restrictions in a number of overseas countries, political uncertainties in the Far East, and growing competition from continental Europe. The controls governing dyestuffs, solvents, potash compounds and a number of other chemicals were somewhat relaxed as from January 1, but imports and exports of most products remain subject to license. More chemicals have become liable to Key Industry Duties.

The need for additional finance to cover the cost of expansion schemes and increased stock values is reflected by several recent transactions. Brotherton & Co. Ltd., one of the largest individual firms in the basic inorganic chemicals field since 1878, has been converted into a public company with a capital of $5,100,000 and a private investment trust with a capital of $5,900,000. May & Baker Ltd., fine chemicals and pharmaceuticals makers of "M. & B" sulphonamides fame, have raised their capital from $1,060,000 to $2,650,000. Geigy Co. Ltd., the dyestuffs company, has increased its capital from $80,000 to $1,600,000. Pest Control Holdings Ltd. has been formed with a capital of $4,000,000 to acquire the whole or part of the share capital of Pest Control Ltd., and Morgan Refractories Ltd. has been registered with a nominal capital of $2,000,000.

After four years of intensive research in the ICI laboratories at Manchester, England, and field experiments at Khartoum, in the Sudan, Nairobi, Kenya, and Entebbe, Uganda, the discovery of a drug to protect cattle from the effects of attack by the tsetse fly in tropical Africa has been announced by the British Colonial Office, which describes it as one of the great advances made in science.

While experiments with the im-

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assure low cost dependable performance

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Your Walworth distributor will give you full information on the **complete line** of Walworth steel, iron, and bronze valves, and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

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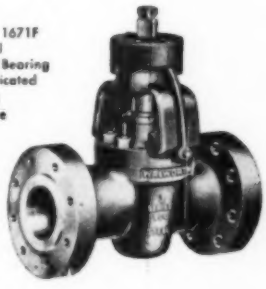


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"500 Brinell" Seat & Disc



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No. 1671F
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PORTABLE WIDE-RANGE
FLOW TESTING KIT

FOR LABORATORY RESEARCH AND
FIELD FLOW RATE CHECKING WORK

ACCURATE
VERSATILE
INEXPENSIVE



"C-Clamp" FLOWRATOR meter kit. The meter is provided with a convenient carrying handle, base plate and hose connectors.
NET PRICE $84.50

Practically any laboratory or field problem that requires an accurate determination of the flow rates of liquids or gases is readily handled with the versatile F&P FLOWRATOR (formerly called Rotameter) flow meter kit.

The new "C-Clamp" FLOWRATOR instrument kit consists of an extremely flexible combination of one meter, four metering tubes and six readily identified floats. The selection of proper tube and float combinations is simplified. The "C-Clamp" meter construction permits easy disassembly for quick metering tube changes. Capacities from 0.065 to 2200cc/min. of water and 5.0 to 36,800 cc/min. of air are covered. Send for Catalog 30 for details.

FISCHER & PORTER CO.
DEPT. 8U-9E HATBORO, PENNA.

FLOWRATOR
TRADEMARK

munization of cattle are still proceeding, two to three tons of the new drug which is called Antrycide will be produced by ICI this year. The whole of this quantity will be sent to East Africa to cure or immunize about 2,000,000 animals. Later field trials will also be carried out in West Africa. Eventually an area of 4,500,000 sq. mi. may be made safe for cattle raising. It would not be necessary to immunize every animal, according to expert investigations; protection of those on the edge of the bush would presumably be sufficient. As the best strains of cattle have been most susceptible to disease, it is believed that Antrycide will permit the raising of beasts of better quality.

Antrycide is a white crystalline powder which is used in the form of hypodermic injections. The cost of an injection which provides protection for four to six months is only a few shillings, but rounding-up of the herds and other incidental costs may be more expensive. Antrycide is one of many synthetic chemical compounds studied by a team led by the late Dr. F. H. S. Curd (who lost his life in a recent rail accident) and Dr. D. G. Davey, both of whom had a share in the discovery of Paludrine, the anti-malarial drug, in 1945.

Production Progress

Satisfactory prospects are reported by Turner & Newall Ltd., the asbestos company with manufacturing subsidiaries in Britain, Canada and the United States. Keasbey and Mattison Co. has kept production at Ambler, near Philadelphia, at St. Louis, Mo., and at New Orleans, La., at the maximum level permitted by raw material availabilities. The New Orleans factory which began operations early in 1948 is now in full production. The new factory at Montreal is structurally complete. The six Turner Asbestos Cement factories in Britain had a record year. A new conveyor belt factory being erected for Turner Bros. Asbestos Co. at Hindley Green, near Wigan, will be opened shortly. Washington Chemical Co. reports further progress in the production of rubber-reinforcing agents.

Anglo-Transvaal Consolidated Investment Co. which has been granted a government license for a plant for the manufacture of oil from coal states that the process to be used is that applied by the Texas Co. at Brownsville, Tex. The South African plant will be located in the Vereeniging area, within short haul of the Greater Witwatersrand, where low-grade coal, water, power and engineering facilities are all available. Its capacity will be exactly the same as that of the Brownsville plant. Meanwhile the

Comfortable AO R-1000 RESPIRATOR

Protects Against Over 140 Hazards by 7 Interchangeable Cartridges



Called the "7 in 1" respirator because of its seven interchangeable cartridges, AO R-1000 Respirator provides perfect protection against more than 140 noxious and nuisance gases, vapors and dusts.

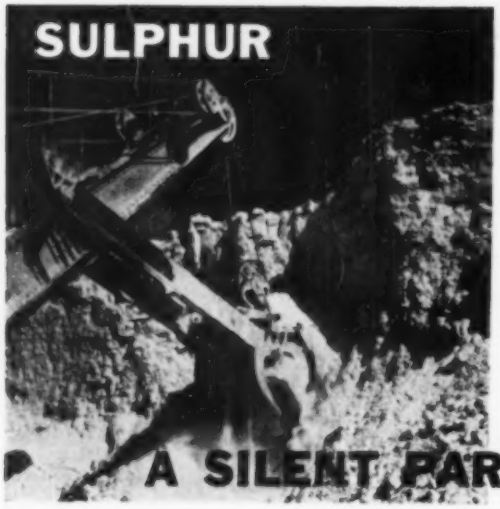
Construction of the cartridge combined with design adaptability of the respirator make breathing easy — the inhalation valve admits air at the lightest intake of breath — exhalation valve provides complete air expulsion. The valve cannot stick. Moisture cannot collect. Dust cannot infiltrate. Due to rubber pliability and smoothly rounded face contacting edges, the AO R-1000 Respirator fits any face safely and comfortably *without adjustment.*

The AO Respirator Guide, showing proper protection against specific exposure hazards, is yours for the asking.

American Optical COMPANY

Safety Products Division

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



Crude Sulphur, blasted from a storage block of Freeport Sulphur Company at Port Sulphur, Louisiana, is ready for shipment to Industry.

One of a series of Stories of Sulphur

AMERICAN Industry has a "silent partner." The food we eat, the clothes we wear, the houses we live in, countless articles we use every day—all bear the touch of this quiet, hardworking friend.

THIS valued "silent partner" is Sulphur, which gives its unique chemical properties to a multitude of industrial processes. For instance, Sulphur is used in the production of pulp and paper, rubber, steel, petroleum products, rayon, industrial chemicals and fertilizer. These are only a few of the industries which need the help of Sulphur. Sulphur, too, is a versatile partner for the industrial chemist. In the constant search for new products and new methods, Sulphuric Acid is the chemist's most useful tool.

INDUSTRIES, old and established, new and modern, those still in the test tube stage, all owe much to this hard-working "silent partner," Sulphur.

FREEPORT SULPHUR COMPANY

OFFICES: 122 East 42nd Street, New York 17, N. Y.

MINES: Port Sulphur, Louisiana • Freeport, Texas

SULPHUR SERVES INDUSTRY

South African Torbanite Mining and Refining Co., a subsidiary of the Anglo-Transvaal Consolidated Investment Co., has overcome the mining difficulties and found a ready market for gasoline, bitumen and byproducts from the retorts at Ermelo and the refinery at Boksburg. The Anglo-Transvaal thus hopes to make soon a substantial contribution from native sources to South Africa's motor fuel supplies.

Byproduct Sulphuric Unit For Argentina

BUENOS AIRES—As of June 1, 1949, a sulphuric acid plant in Puerto Borghi, Argentina, will produce at the rate of 40,000 tons per year, thus avoiding imports of sulphur into Argentina (14,000 tons last year) and saving $5.2 million in exchange including the profit from export of zinc products, according to a government announcement.

Pakistan Gets American Help On Pharmaceutical Plants

KARACHI—Two American firms, Evans Research & Development Corp. and Foster D. Snell Inc., are consulting engineers in the establishment of Pakistan's first nationally-owned pharmaceutical plant. The new company, Eastern Chemical Industries Ltd., is capitalized at $750,000.

Chemical Phosphates Will Be Made in Canada

OTTAWA—R. B. Walker, president of the Electric Reduction Co. at Buckingham, Que., has announced that a $2,000,000 extension to the company's plant is to be built adjacent to the present plant for the purpose of manufacturing molecularly dehydrated phosphates which are the ingredients in the production of detergents or soapless cleaners. It is to be completed in two years.

The Buckingham plant was the sole Canadian producer of white phosphorus during the war and Mr. Walker declared that the peacetime demand looked as though it would surpass that of the war years. The complex phosphates to be turned out of the proposed plant are in heavier demand for the manufacture of new detergents and the Buckingham plant will be the only Canadian producer of such phosphates.

Mr. Walker also disclosed that his company has the approval of the Canadian Government for the project and it is being allowed to buy American-made machinery under the Canadian dollar-saving program. The company



PUT THE PLUS

IN YOUR PROCESS

. . . Constant source of supply.

. . . Production control through uniformity.

. . . Exacting specifications . . . assured quality.

. . . Extensive facilities of 5 modern plants.

2270 years ago, Alexander the Great had conquered the entire civilized world. At the age of 32—as master of the earth—Alexander wept, for there were no more worlds to conquer . . .

So the story goes—but a far more dramatic one has been written by chemistry and its "conquerors", for there are always new worlds to win in the conquest of matter and methods—in the elimination of disease and famine, waste and want. Research recognizes no limitations, with newer and finer chemicals constantly at hand to point the way.

Heyden has always geared its facilities and creative skill to industry and science, offering the maximum in quality, purity and perfection in chemicals. Today, there are very few process industries—from drugs to dyes, perfumes to plastics, rubber to resins, leather to lubricants—which do not use Heyden's finer chemicals—to put the PLUS in their process!

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HEYDEN CHEMICAL CORPORATION

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CHICAGO 6: 20 North Wacker Drive • PHILADELPHIA 3: 1700 Walnut Street • SAN FRANCISCO 11: 420 Market Street

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A perfect blend in 5 minutes with...

GEMCO *Conical Blender*

UNIFORM particle dispersion and thorough blending of dry material, powder or granule before or after pulverizing.

RAPID, smooth, vibration-free operation. (Totally enclosed worm gear drive.)

ECONOMICAL, very low power consumption.

CLEAN . . . conical shaped blender permits 100% emptying, without dust, and with minimum chances of contamination. Easy to clean. No baffles.

SIMPLE . . . one-man operation.

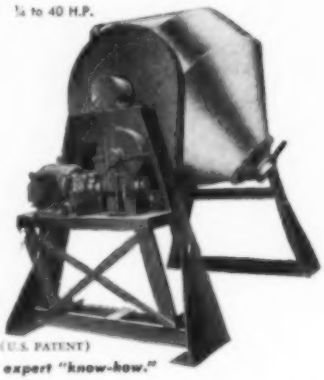
SAFE . . . minimum "occupational hazards for workers."

SELF-CONTAINED, precision-built, assembled and inspected carefully in our own plant. (Motor is built into unit.)

CAPACITY . . . blends batches up to 25,000 lbs.

CUSTOM-BUILT FOR *Your* JOB!

¼ to 40 H.P.



(U.S. PATENT)

Backed by over 30 years of expert "know-how."

Employing the GEMCO *Spherical Valve*



Never sticks. Openings from 2" to 14".

Our efficient, dust-tite, quick-acting ground valve, acclaimed for its steady, trouble-free performance on short and long runs. A smooth working companion for the GEMCO Conical Blender.

Operated by a hand-wheel. A chain extends from this wheel to the opposite end of the mixer, so valve can be operated freely, in both up and down positions of the valve opening. "Works like a charm."

Additional Exclusive Features . . . IF YOU WANT THEM

For maintaining particle size. For dispersion of material which tends to ball or lump (breaks material while blending). Adaptation for rubbing out material (while blending). Jacketing to keep batches at required temperature. Provision for penetrating shell for injection of gas or liquid (while blending), or for vacuum processing.

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General Machine Company of New Jersey

Established 1916

SPECIAL CHEMICAL AND MIXING MACHINERY • SPHERICAL VALVES

400 MARKET STREET • NEWARK 5, N. J.

is owned by British interests. He stated that some work has already been done on the extension and that it would be completed by 1950 if materials were supplied on schedule, with the training of key personnel for the work in the proposed extension having started. This addition would mean a 50 percent payroll increase from the present 400 men to approximately 600 employees.

Sweden Gets Corrosion Removal Fluid

STOCKHOLM—Rust chipping, which now keeps valuable tonnage idle in port for many weeks a year, may be eliminated in the future after the marketing of a new Swedish rust-removing compound known as Corrosan. First used to remove the zinc coating of galvanized steel plate, it dissolves the rust without attacking the iron. There are two types: Corroson fluid for the immersion of small or medium-sized objects, and Corrosan emulsion for spraying on large objects, such as ships, heavy machinery, etc. Superficial rust is removed in about two hours by immersion, while heavier rust requires a somewhat longer treatment. The firm also manufactures an anti-corrosion compound for protective treatment after cleaning. The new method has already been adopted by many leading Swedish industrial concerns, among them the great mining companies in northern Sweden. Contracts for the manufacture on license have been concluded with a number of foreign countries. In Denmark, for instance, a chain of 65 "anti-rust stations" will be established.

Pacific Mills Expands At Ocean Falls

OCEAN FALLS, B. C.—Major projects of a $5,500,000 pulp and paper expansion have been completed here by Pacific Mills, Ltd. A truly objective description of the program would include something on the expanded logging operations, on better living, working and recreation facilities provided to employees, and on industrial power installations. But of more interest to chemical engineers are the major phases bringing higher pulp production, economy and efficiency.

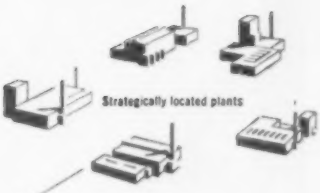
Kraft output has been boosted from 140 to some 175 tons daily. To do this, four 2.5-ton digesters have been replaced by four 3.5-ton units with 2-in. shells and belts 3.5 in. thick and 4 ft. wide around the middle to increase strength. A Swenson-Nyman kraft washer has been installed. A Dorr continuous recausticizing system



Convenient sales offices—ample local stocks the nation over



Specialized technical service



Strategically located plants

Whichever way you look at it...

TRADE MARK



Long experience . . . accumulated knowledge



Quick delivery and shipping service

It pays to specify SOLVAY

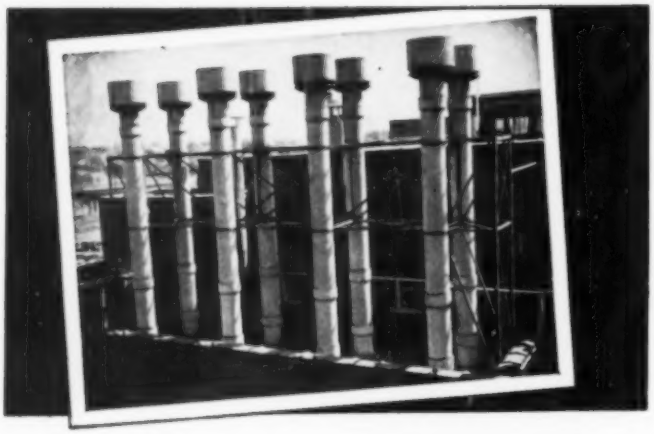
TRADE MARK REG. U.S. PAT. OFF.

With today's costs of manufacturing so high, it's the wise chemical buyer who considers his purchases from every angle. Price and specification alone are no longer basis enough for a buying decision.

There is a good deal more a buyer can expect—speed of delivery, technical service, big-plant capacity to assure continued supply, knowledge of the industry and experience with its problems. On all these counts, more and more manufacturers agree, "it pays to specify Solvay."

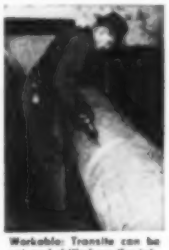
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Soda Ash • Caustic Soda • Caustic Potash • Chlorine • Potassium Carbonate • Calcium Chloride • Nytron • Sodium Bicarbonate • Specialty Cleansers
Ammonium Bicarbonate • Sodium Nitrite • Para-dichlorobenzene • Ortho-dichlorobenzene • Monochlorobenzene • Methanol • Ammonium Chloride • Formaldehyde



Records show long service in tough service . . .
for Transite Industrial Vent Pipe

In installations in many industries where corrosive fumes, vapors, dusts, and gases are encountered, Transite Industrial Vent Pipe is yearly demonstrating the fact that it is a practical, economical answer to tough venting problems.



Workable: Transite can be cut and drilled on the job.

Because it is an asbestos-cement product, this strong, durable pipe stands up in many types of corrosive service . . . helps avoid costly replacement . . . results in important reductions in plant maintenance.

Easily installed—Transite Industrial Vent Pipe has many practical installation advantages. It is light in weight and easily handled. It is readily worked and can be quickly cut and drilled on the job with ordinary tools.

Easily adapted—Made in a range of sizes up to 36" in diameter, Transite Industrial Vent Pipe is readily adapted to use as vents, ducts, and stacks. A full line of Transite fittings provides a venting system that is corrosion resistant throughout.



Adaptable: A complete line of Transite fittings meets most job requirements.

Economical to maintain—Transite is completely rustproof... highly weather resistant . . . needs no painting . . . resists corrosion outside, inside and all the way through. For full details about Transite Industrial Vent Pipe, write Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville TRANSITE Industrial Vent PIPE

replaces the older batch system. This gives considerable savings in soda, steam, labor and maintenance, more efficient handling of pulp, and a better grade of pulp.

Production of sulphite pulp has been increased from 65 to 100 tons daily. Improvements here include a 25-ft. spherical hot-acid accumulator which absorbs hot relief gases and provides more uniform cooking conditions. Important economies in heat consumption and chemical usage result.

Facilities for zinc hydrosulphite bleaching of groundwood have been modernized. Circulating retention chests and washers which remove residual corrosive acids have been installed. To minimize corrosion, acid-resisting materials are used to handle unwashed stock and washers effluent. A new screening system gives savings in sliver rejects of some six tons daily.

New asbestos-lined aluminum hoods have been installed on two high-speed newsprint machines, reducing fire hazards, providing more uniform conditions for paper drying, and reducing corrosion of the steel roof. A similar hood is being installed on a specialty paper machine.

Although the present expansion is completed, other plans are on the way. These include (1) conversion of the zinc hydrosulphite manufacturing process to a continuous system, and (2) erection of a new paper converting plant at Vancouver, B. C.

Australia Becoming Empire Sugar Bowl

MELBOURNE—Australia's cane crop this year is expected to yield 910,000 long tons of raw sugar—an all-time record. The previous best Australian harvest was 901,000 long tons in 1939. Fijian raw sugar production is also expected to set a new record with 136,000 tons.

Australia's consumption is 500,000 long tons, leaving 410,000 tons for disposal under contract with the British Ministry of Food.

Colonial Sugar Refining Co. Ltd., Australia's only refining organization, has set up a $10-million chemical subsidiary to develop fermentation by-products, including acetone, butyl alcohol and cellulose acetate. The plant will be constructed at Rhodes, New South Wales.

Indian Industralization Falls Behind Schedule

BOMBAY—Evidence of how India's industrialization is lagging behind plans is contained in a recent survey

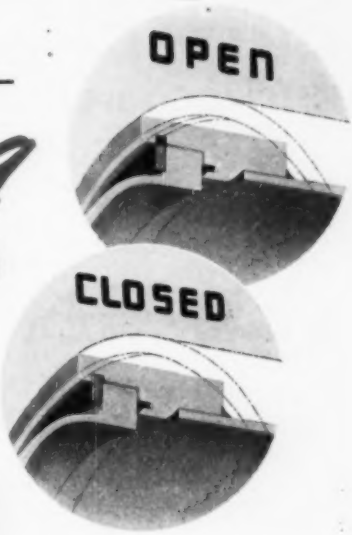
Struthers Wells

MANUAL OR HYDRAULIC

Patented

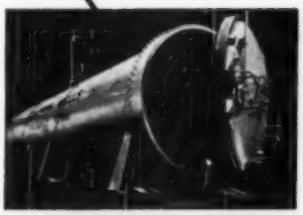
Quick Opening DOORS

Now Available in Two Types



For quick opening of the door (above), the locking ring is contracted. When door closes, the locking ring is expanded.

HINGED



This hinge type door is equipped with an hydraulically operated locking ring mechanism. The door is mounted on anti-friction bearings for easy movement.



Manually operated hinged Quick Opening Door is shown in the open position.



Manually operated door in the closed position. Although this photograph shows the door flange rivated to the vessel, most models are welded.

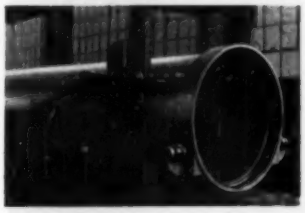
OVERHEAD



Overhead type Quick Opening Door shown in the sealed position.



Door in the process of being lifted overhead demonstrates the small area required for the operation—a great advantage when floor space is limited.



Complete freedom of floor space for rapid charge of cylinder is permissible when door is in full open position.

Simplicity and ease of operation are combined in the Struthers Wells Quick Opening Door—making it a truly significant advancement in the design of pressure vessels for every industry. This development makes for easier handling, faster opening and closing, less lost time and long reliable service.

Key to efficient operation is a split ring, fitting in a circular groove in the door frame. The ring is operated either manually or hydraulically.

A safety device is incorporated so pressure cannot be applied to the vessel if locking ring is not properly seated. Also, it cannot be opened until pressure is relieved. A motor driven pump unit for actuating cylinders is included on each hydraulic model.

Write for the new Quick Opening Doors Bulletin, No. T-1200.

STRUTHERS WELLS *Corporation*

Plants at Titusville, Pa., Warren, Pa.

PROCESS EQUIPMENT DIVISION
TITUSVILLE, PENNSYLVANIA

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Users of our products know that we can supply ALL types of thermocouple equipment to meet ALL regular and special temperature measuring applications.

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THERMOCOUPLES
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QUICK COUPLING CONNECTORS
•
CONNECTOR PANEL BOARDS
•
PROTECTION TUBES
•
EXTENSION LEAD WIRES



Thermo ELECTRIC CO.
FAIR LAWN, N.J.

FILTER CLOTH

FOR CORROSIVE LIQUIDS

Write us regarding
New Acid and Alkali-proof
FILTER FABRICS

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"SARAN"
WOVEN GLASS CLOTHS
NYLON FABRICS

COTTON AND SPECIAL FABRICS FABRICATED INTO TUBES, BAGS, ETC., FOR ALL PURPOSES

Write for prices. State size, width, quantity, type of filter used.

ALL KINDS OF
• *DUST COLLECTOR BAGS* •

WM. W. STANLEY CO., Inc.
401 Broadway, New York 13, N. Y.

of the chemical industry by a government-appointed panel.

Stating that India's output of caustic was only 3,000 long tons a year compared with requirements of 70,000 long tons, the panel revealed that although permits were granted as much as several years ago for establishment of 14 new plants only 4 of the prospective companies have placed orders for equipment.

Soda ash requirements were put at 120,000 long tons a year compared with production of only 30,000 long tons out of a capacity of 55,000. Supply of cheap salt is the greatest problem here.

Forty plants were reported producing 75,000 long tons of sulphuric acid annually, and import licenses have been granted for import of another 50,000 which assures a supply equal to requirements.

Labor-Management Groups Encouraged in Canada

OTTAWA—With such committees in the chemicals and allied products industry showing remarkable success, Canada's Minister of Labor, Hon. Humphrey Mitchell, has disclosed now that there is a steadily increasing number of labor-management production committees throughout Canadian industry, including no less than 21 such committees in the chemicals and allied products industry.

Mr. Mitchell stressed here that there were many instances on record where workers talking things over with management had been able to put forward valuable ideas for more efficient methods of operation. Labor-management production committees in Canada are made up of representatives for management and labor and function in an advisory capacity on all matters affecting industrial productive efficiency. They do not deal with subjects covered by collective bargaining agreements.

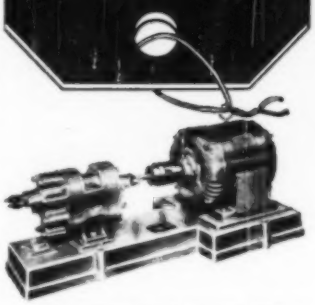
India May Get Phosphate Fertilizer Plant

BOMBAY—One of the most vital problems of agriculture in India is soil acidity. So states M. R. Narayanaswamy, who was recently sent to Seattle, Wash., by the Madras government to study the calcium magnesium phosphate fertilizer process of Manganese Products, Inc. The firm combines olivine and phosphate rock to produce a high-quality phosphate fertilizer and hopes to work out a similar process using minerals found in India. With him Narayanaswamy brought ten tons of phosphate nodules and magnesite to be processed by Manganese Products.

MAINTENANCE CREW HANDS OFF!

--it's a

SIER-BATH ROTARY PUMP



Sier-Bath Screw Pumps and Gearex Pumps are designed to do a job—and keep doing it. The manufacturer has a full appreciation of the high cost of interrupting the operation of a line to permit pump repairs. On the Internal Gear-type Screw Pump, for example, the gland is the only point of attention and as this is on the suction side, it is almost negligible. It is not unusual for the packing to last two years without repacking. The pressure on the gland is so slight that it is possible to add a new ring of packing without shutting down the unit. Send for information.

ALSO MAKERS OF SIER-BATH PRECISION GEARS

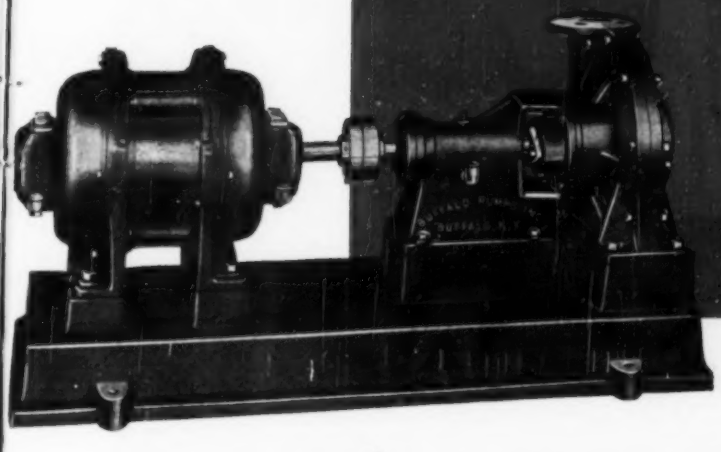
FOUNDED 1905 MEMBER A.G.M.A.

Sier-Bath
GEAR and PUMP CO., Inc.
9259 HUDSON BLVD NORTH BERGEN, N J

DEFEAT CORROSION WITH

This Pump when you handle

—Chlorinated Solutions
—Concentrated Hydrochloric
—Other Corrosive Liquids
—Solutions Containing Abrasive Solids



"Buffalo" **RUBBER-LINED PUMP**

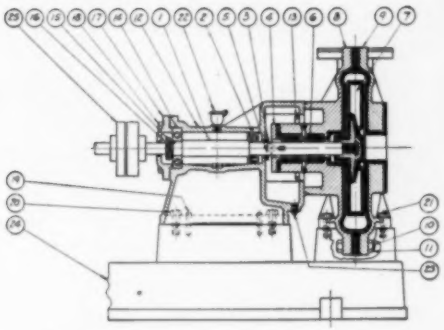
WHAT SAVES YOU THE MOST MONEY IN PUMPING

is a pump that (1) doesn't cause maintenance troubles and (2) gives you maximum liquid handling with minimum power. "Buffalo" Rubber-Lined Pumps qualify strongly both ways. They're *special* pumps, the best you can specify for the above-named liquids. "Buffalo" builds pumps for every chemical liquid. It's wasted money to buy a pump *not* built for your liquid—but it's the soundest kind of economy to specify the *right* "Buffalo" Pump!



Get the Facts

on pumping *your* chemical liquid at lowest cost year after year—write for Bulletin 982, at left.



HERE'S LONG-LIFE CONSTRUCTION!

Heavy dark lines in the above sectional drawing of a "Buffalo" Rubber-Lined Pump show how rubber protects all internal pump parts exposed to liquid. Hard or medium rubber is used, according to the liquid to be pumped. Note also the sturdy shell, bearing stand and subbase—the special rotary seal—the ball bearings, and other features that give you top performance under the severest pumping conditions!

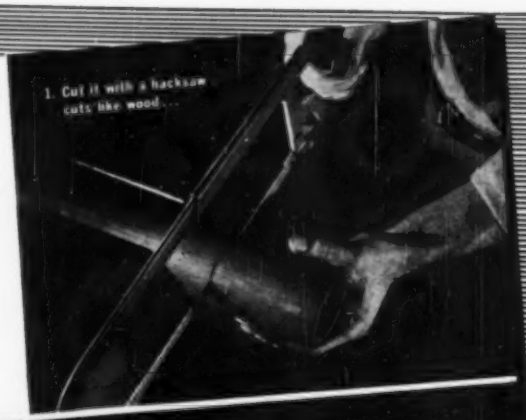
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BUFFALO PUMPS, INC.

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Canada Pumps, Ltd., Kitchener, Ont.
Branch Offices in All Principal Cities

"A Better CENTRIFUGAL PUMP for Every Service"

"KARBATE" Impervious Graphite Pipe is easy to cut...thread... or serrate!











KEEP "KARBATE" PIPE ALWAYS IN STOCK!

- Resists the action of acids, alkalis and other chemicals
- Light weight with adequate strength
- Resistant to mechanical shock
- Immune to thermal shock
- Easy to machine and install
- Full range of sizes and fittings

The term "Karbate" is a registered trade-mark of
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Write for catalog section M-8800B to National Carbon Company, Inc., Dept. CE.

These products sold in Canada by Canadian National Carbon Co., Ltd., Toronto 4, Canada

THE CORROSION FORUM

Edmond C. Foller, ASSISTANT EDITOR

Hydrochloric Acid versus Construction Materials

Part III of a symposium in which a representative group of construction materials are evaluated for services involving hydrochloric acid.

PRECIOUS METALS

E. F. ROSENBLATT
Baker and Co.
Newark, N. J.

Silver is satisfactory for dilute hydrochloric acid solutions at low temperature. Acid of higher concentration, especially in the presence of air or other oxidizing agents leads to corrosion. The silver chloride film on the metal does not afford sufficient protection in those cases, possibly due to its solubility in the acid.

Gold is excellent against hydrochloric acid solutions provided that oxidizing agents are rigorously excluded. Presence of even small amounts of nitric acid or iron salts leads to severe losses. Hydrochloric acid gas has little or no effect on gold up to about 900 deg. C. At higher temperatures the attack becomes very severe.

Palladium is also completely satisfactory against hydrochloric acid on exclusion of any oxidizing agents. Due to its relative cheapness, palladium deserves consideration even for high temperatures.

Platinum and platinum alloys are without doubt the best metals to withstand corrosion by hydrochloric acid under almost any conditions, as long as strongly oxidizing agents are absent. Iron chloride and also cupric chloride in boiling concentrated acid lead to losses which vary between 6¼ and 13 mils per yr. for the best alloys, as for instance iridium or rhodium-platinum; the loss is still higher with platinum. Milder oxidizing agents, Nitrobenzene, for instance, are without effect. Flowing gaseous hydrochloric acid causes only a relatively slight loss of 0.8 mils per yr. at temperatures as high as 1,200 deg. C.

SILICONES

J. A. McHARD AND
LEON VANVOLKINBURG
Dow Corning Corp.
Midland, Mich.

COMMERCIAL silicones are exceptionally resistant to aqueous hydrochloric acid at ordinary temperatures. With the exception of certain types of silicone rubber all of the silicone products that have been tested show remarkable stability to aqueous hydrochloric acid at room temperature; many are stable even at 100 deg. C. In pressure lubricated plug valves, a silicone grease has proved to have excellent resistance to dry hydrochloric acid.

Silicone Fluids—In spite of the tendency for dry acids to gel silicone fluids, aqueous hydrochloric acid has slight effect even in concentrated solution. Data on the resistance of various silicone fluids as indicated by changes in viscosity caused by exposure to aqueous hydrochloric acid in various concentrations at room temperature and at 100 deg. C. are given in Table I. These tests indicate uniformly high resistance except for a slight tendency toward emulsification and gel formation at 100 deg. C.

Silicone Greases—Valve Seal A has

Table I—Silicone Fluids

Resistance to aqueous hydrochloric acid

Type of Fluid	Conc. of HCl, %	Temp., Deg. C.	Original Visc., Cstks.	Change in Visc., %	Remarks[1]	Evaluation[2]
DC 200	10	25	95.6	+2.6		Good
	20	25		+2.1		Good
	Conc.	25		−2.2		Good
	10	100		−5.3		Good
	20	100		−2.3		Good
DC 550	10	25	111.4	+0.6	SE	Good
	20	25		+0.6		Good
	Conc.	25		−5.1	SE	Good
	10	100		+14.7	SE, SG	Fair
	20	100		+23.3	E, G	Poor
DC 701	10	25	10.7	+3.2		Good
	20	25		0.0		Good
	Conc.	25		−2.1		Good
	10	100		+0.3		Good
	20	100		+2.7	SE, SG	Fair
DC 703	10	25	28.1	−1.8		Good
	20	25		+0.4		Good
	Conc.	25		−6.8	SE	Good
	10	100		−0.4	SE	Good
	20	100		+5.7	SE, SG	Fair

[1] E, emulsification; SE, slight emulsification; G, gelation; SG, slight gelation. [2] Ratings are based on observation of the condition of the test samples as well as on measurable changes in viscosity.

Table II—Silicone Resins

Resistance of cured samples (1 x 3 x 1/16 in.) to aqueous hydrochloric acid (ASTM D-543-43)

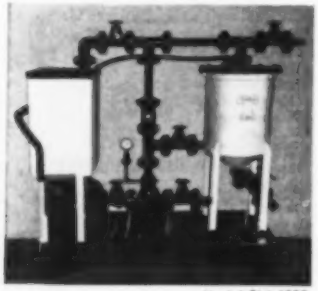
Type of Resin	Curing Temp., Deg. C.	Conc. of HCl, %	Ten p., Deg. C.	Change in Wt., %	Rating*
DC 993	250	10	25	0.0	Good
		20	25	0.0	Good
		Conc.	25	+0.1	Good
		10	100	+0.5	Good
		20	100	+0.5	Good
DC 996	150	10	25	0.0	Good
		20	25	+0.1	Good
		Conc.	25	+0.2	Good
		10	100	+1.0	Good
		20	100	+0.4	Good
DC 996	250	10	25	0.0	Good
		20	25	0.0	Good
		Conc.	25	+0.2	Good
		10	100	+0.6	Good
		20	100	+0.5	Good
DC 2103		10	25	−1.9	Good
Fiberglas		20	25	−2.3	Good
Laminate		Conc.	25	−0.9	Good
		10	100	−6.1	Good
		20	100	−10.5	Fair (weakened)

* Ratings are based on changes in weight and on visual inspection of the samples.

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Table III—Silicone Rubber

Resistance to aqueous hydrochloric acid (ASTM D-543-43)

Silastic	Conc. of HCl, %	Temp., Deg. C.	Wt. Increase, %	Vol. Increase, %	Shore Efficiency Retained, %[1]	Shore Efficiency After Reconditioning, %[2]	Rating[3]
180	10	25	3.8	1.0	100	100	Good
	20	25	6.9	14.0	100	100	Good
	Conc.	25	6.6	8.0	60	100	Good
	10	100	28.5	33.0	100	50	Fair
	20	100	43.3	52.2	-	-	Poor
181	10	25	0.0	4.8	100	100	Good
	20	25	1.9	2.3	100	100	Good
	Conc.	25	1.0	1.9	50	100	Good
	10	100	16.0	32.5	100	100	Fair
	20	100	29.8	78.8	100	hard, brittle	Poor

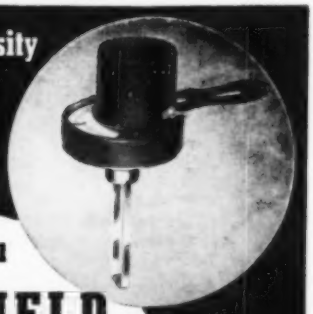
[1] Percent Shore efficiency retained = (100) (hardness × elasticity before exposure)/(hardness × elasticity after exposure). [2] After seven days in air. [3] Rating is based on measured changes in weight, volume, durometer and elastometer readings and on observation of the samples after exposure and after reconditioning.

been used successfully in various plants as a lubricant for valves in service lines handling dry HCl both at low and high temperatures. This silicone grease has also been used to prevent the seizure of fittings and bolts used on equipment handling hydrochloric acid. The grease does not, however, prevent corrosion.

Silicone Resins—All of the silicone resins tested have shown good resistance to aqueous hydrochloric acid at room temperature as shown in Table II. At 100 deg. C. tests were run only with 10 and 20 percent acid. Under these conditions, the one resin that was rated as having only fair resistance was DC 2103 in 20 percent acid.

Silicone Rubber—Two grades of Silastic (trade name for Dow Corning silicone rubber) were designed primarily for applications requiring good chemical resistance; they are Silastic 180 and Silastic 181. Other types of Silastic show varying degrees of deterioration and are generally not recommended for use in contact with hydrochloric acid. As indicated by the data given in Table III, however, both Silastic 180 and Silastic 181 have good resistance to all concentrations of aqueous hydrochloric acid at room temperature. Their resistance at 100 deg. C. is fair in concentrations up to 10 percent. This fact may suggest special techniques for using gaskets of Silastic in certain types of equipment. The release properties characteristic of sili-

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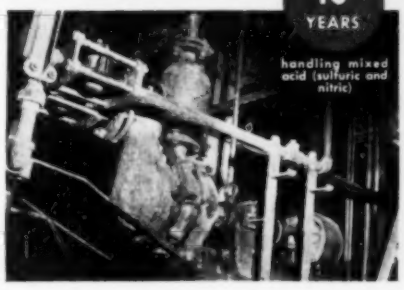
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CHLORIMET NO. 2 – nickel-base, high molybdenum alloy; CHLORIMET NO. 3—nickel-base, high molybdenum, high chromium alloy. These are high-strength, machinable alloys. Chlorimet No. 2 handles HCl in all concentrations and temperatures. It is excellent for hot H_2SO_4 acid under reducing conditions and wet hydrogen chloride gas. Chlorimet No. 3 handles most acids under oxidizing conditions, various salt solutions, also hot sulfuric in concentrations of less than 35%. *Ask for Bulletins 114 and 815.*

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Installation of 4-Bag MIKRO-COLLECTOR (left) as auxiliary to No. 8 MIKRO-ATOMIZER (right). Atomizer grinds 2000 lbs. of a plastic material per hour to an average fineness of 5 microns. Collector handles 3600 c.f.m.

The new MIKRO-COLLECTOR*, which supplements the well known line of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS, is truly a triumph in the art of dust collection. For, it is radically different from any other system of its type. The revolutionary principles employed insure optimum dust recovery and sensational filter rates.

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Interior view of Single-Bag MIKRO-COLLECTOR

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* Patent applied for by H. J. Hersey, Jr. and Pulverizing Machinery Company

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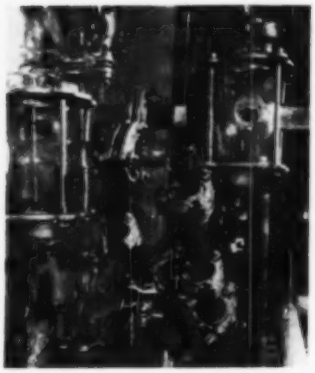
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Glass pipe and valves in HCl service.

GLASS PIPE

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THE USE of glass equipment for the manufacture of chlorine and hydrochloric acid has increased considerably during the last 15 years. It has found wide application in the form of glass piping, heat exchangers and other glass plant equipment. For conveying cold HCl during the last stages of manufacture, glass pipe is recommended where C.P. acid is concerned since it reduces contamination practically to zero.

In the handling of HCl at elevated temperatures where a number of factors become serious, glass pipe has several advantages. Even at high temperatures, its chemical inertness insures against contamination and its low coefficient of expansion reduces breakage from both thermal shock and from mechanical strains in the installation as a result of thermal expansion. Maximum recommended internal operating pressure is 50 psi. Normal operating temperature extends up to 250 deg. F. with maximum of approximately 400 deg. F. As for thermal shock, Pyrex piping is often flushed with live steam, immediately followed by cold water. For safety it is well to avoid shock greater than that occurring when glass at 185 deg. F. is sprayed with ice water.

For coolers, a special, thin walled tubing is manufactured. The ends of these tubes are flanged (same as the pipe), to permit bolting to return bends. In addition, these tubes have a heavy walled section of pipe near each end which furnishes the mechan-

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Butadiene—$CH_2{:}CHCH{:}CH_2$
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Diisobutylene—$CH_2{:}C(CH_3)CH_2C(CH_3)_3$†
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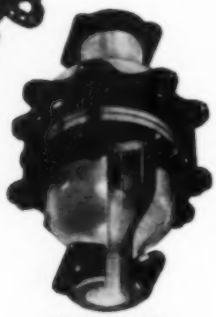


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Each Illinois valve has a very carefully ground and lapped valve seat which will hold chemicals at high pressures. Every valve is routine tested at 100 pounds pressure for a minimum of one hour to assure a perfect valve seat. Note that valve seat is located in lowest possible position to insure uninterrupted flow of material when stem is in open position. Packing is acid-resisting asbestos — graphite impregnated.



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ical strength required to resist the compression of the stuffing box packing. Maximum recommended internal pressures on heat exchanger tubes varies from 50 psi. for 1 in. I.D. to 15 psi. for 4 in. I.D. The external pressure (in jacket) may be as high as 100 psi. for cooling water or 50 psi. steam. There are a number of exchangers in use (with adequate protection) at 100 psi. external steam pressure.

DURIMET-20

WALTER A. LUCE
The Duriron Co.
Dayton, Ohio

This alloy shows satisfactory resistance to many hydrochloric acid solutions providing the temperature does not exceed normal atmospheric conditions. Corrosion tests indicate that it is satisfactory up to approximately 25 percent concentration. For example, it showed a very low rate of corrosion when tested in a solution consisting of 3 percent acetic acid and a slight amount of hydrochloric acid at room temperature. Durimet-20 pumps are giving long, trouble free service for handling a spent acid solution at normal temperatures consisting of hydrochloric acid, sulphuric acid, nitric acid and hydrofluoric acid, all in small amounts.

Durimet-20 is an austenitic stainless steel with a nominal chemical composition as follows: 29 percent Ni, 20 Cr, 1.75 Mo min., 3.5 Cu min., 1.0 Si and 0.07 C max. It is available in both the cast and wrought forms. Chemical equipment available in the cast alloy includes pumps, valves, fans, ejectors, jets and mixing nozzles. Wrought Durimet-20 is available from the Carpenter Steel Co. under the name Carpenter Stainless 20. At present it is available in the form of wire, rods, bars, strip and welded pipe and tubing.

Although this alloy exhibits satisfactory resistance to certain hydrochloric solutions as noted above, the high-silicon iron, Durichlor, and the nickel base Chlorimet alloys are (among the alloys produced by this company) usually preferred for all hydrochloric acid services since they are resistant even at elevated temperatures.

NICKEL AND NICKEL ALLOYS

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chemical and process industries are in the handling of solutions or mixtures which contain moderate amounts of hydrochloric acid. Such applications include the distillation and condensation of chlorinated solvents and other chlorinated organic materials containing moisture, and of numerous non-oxidizing acid chloride salts, where low concentrations of hydrochloric acid are formed during distillation or evaporation. Both nickel and Monel are used for stills and condensers in solvent extraction of oils, solvent degreasing of metals, and dry cleaning equipment using such solvents as ethylene dichloride, trichloroethylene, perchloroethylene, carbon tetrachloride, chloroform and propylene dichloride. They also are used for rectification and condensing equipment in the production of these solvents and of chemical intermediates such as amyl chloride, allyl chloride and chlorobenzenes.

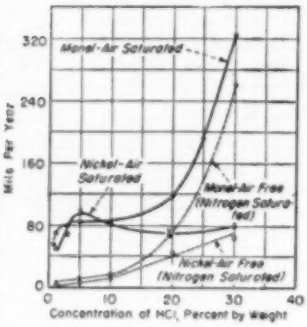


Fig. 1—Corrosion rates of nickel and monel in HCl at 86 deg. F.

Applications of nickel in the handling of acid chloride salts include evaporators and heating coils for ammonium chloride and tin tetrachloride, and condensers for arsenic trichloride and nitrosyl chloride. Monel applications include evaporating equipment for zinc chloride, antimony chloride, manganous chloride and lithium chloride. This alloy is used for upper tower linings, condensers, reflux and run-down lines of petroleum refinery crude oil distillation units where dilute hydrochloric acid solutions are formed by hydrolysis of brines in the crudes.

The results of laboratory corrosion tests of nickel and Monel in both air-free and air-saturated hydrochloric acid solutions at 86 deg. F. are given in Fig. 1. These materials have about equal resistance up to 15 percent concentration. At higher concentrations at room temperature, nickel may be

"Was my face red!"





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"Recently, my new chief engineer suggested that centrifuging would speed our processing up. Looking very superior, I said, 'It won't work, Sam . . . forget it!' "



"But Sam was stubborn . . . he made a test installation and got far better results than anything we'd ever tried before! Naturally we switched to centrifuging on a full scale."



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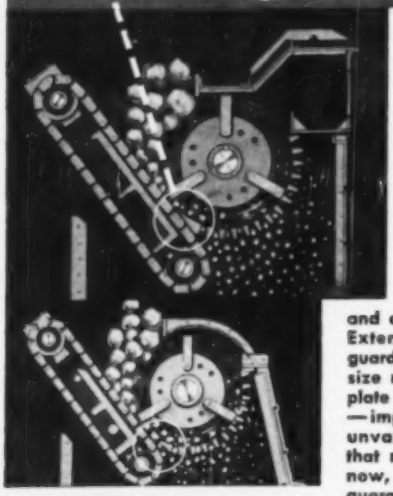
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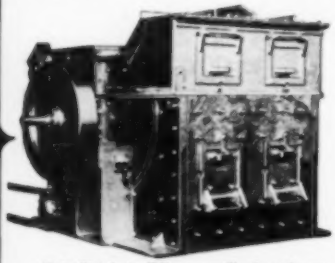
Crushing money is saved or squandered in the "heart" of the mill...where reduction begins! That's why the headline feature of the new improved "36 Series" Dixie Hammermill is the extension of Dixie's Continuously Moving Breaker Plate*...a unique, money-saving innovation that sets a new standard of crushing efficiency.

Note by comparing before and after diagrams how the new, Extended Moving Breaker Plate guards against the passage of oversize material between the breaker plate and front cage bar. The result—improved grinding control for unvarying uniformity of product that makes the Dixie Hammermill now, more than ever before, your guarantee of greater production at less cost.

NEW! IMPROVED!
DIXIE HAMMERMILL

Other important changes in the new "36 Series" Dixie Hammermill include:

- 1. All-steel construction for greater strength . . . longer life.
- 2. Flange type end discs of all cast steel for protection of hammer bolts and nuts from wear at ends.
- 3. Convenient clean-out and inspection door.
- 4. Metal trap (optional) for facilitating removal of tramp iron.



Dixie "36 Series" Hammermills, for primary or secondary crushing, are built in 4 sizes in capacities ranging from 25 to 150 tons.

*U. S. Patents Granted and Pending

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somewhat more resistant than Monel but in practice the use of both materials usually is limited to concentrations under about 20 percent in unaerated solutions and under 5 percent in aerated solutions. Monel pickling tanks are regularly used for handling 10 to 15 percent hydrochloric acid at room temperature.

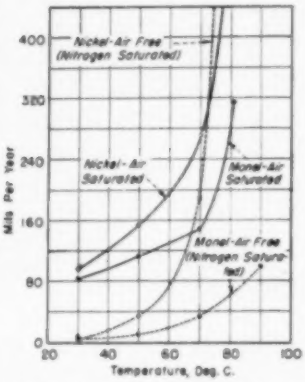


Fig. 2—Corrosion rates of nickel and Monel in 5 percent HCl.

Corrosion rates of both materials are increased by increasing temperature although nickel is affected more in this respect than Monel. The effects of temperature on corrosion rates in 5 percent hydrochloric acid solutions are shown in Fig. 2. In unaerated 5 percent acid, Monel is usefully resistant up to about 165 deg. F. and nickel up to about 130 deg. F. Applications

Table I—Corrosion in Boiling Hydrochloric Acid

Velocity: None. Aeration: None. Duration of tests: 10 days.

Acid Conc. % HCl by Wt.	Corrosion Rate, Mils per Yr. Monel	Nickel
0.5	29	304
1.0	42	650
5.0	244	5,740

Table II—Corrosion of Type 1 Ni-Resist in Unaerated Hydrochloric Acid Solutions at Room Temperature

Acid Conc. % HCl by Wt.	Corrosion Rate, Mils per Yr. Type 1 Ni-Resist	Plain Cast Iron
1.8	5	900
3.6	15	...
5.0	18	1,500
10.0	16	1,200
20.0	45	...

of both materials, and particularly of Monel, in lower concentrations at higher temperatures are common. The results of laboratory corrosion tests of nickel and Monel in boiling hydrochloric acid solutions are shown in Table I. The results of laboratory corrosion tests in various chlorinated sol-


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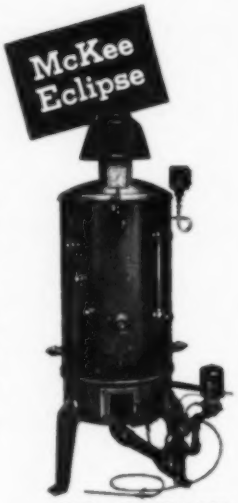
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vents at the boiling point and with water present are given in Table II.

While Inconel possesses fairly good resistance to dilute hydrochloric acid solutions at room temperature, its performance because of its chromium content will usually not be as good as that of nickel or Monel. It has demonstrated good resistance to cold, aerated acid in concentrations under about 2 percent. Caution should be used in applying Inconel to hot hydrochloric acid solutions except where concentrations are very low. It has been applied successfully to such processes as the production of synthetic resins, distillation of pectin, and handling of glandular compounds, where small amounts of residual hydrochloric acid are present from catalytic or extraction processes, and particular resistance to organic materials is required.

Table III—Corrosion Tests in Boiling Chlorinated Solvents With Water Present

Solvent	Corrosion Rate, Mils per Yr. Nickel	Monel
Carbon tetrachloride	1.8	4.4
Chloroform	0.1	4.5
Ethylene dichloride	0.4	2.7
Trichloroethylene	1.0	11.0
Carbon tetrachloride }*	0.2	1.0
Ethylene dichloride }		

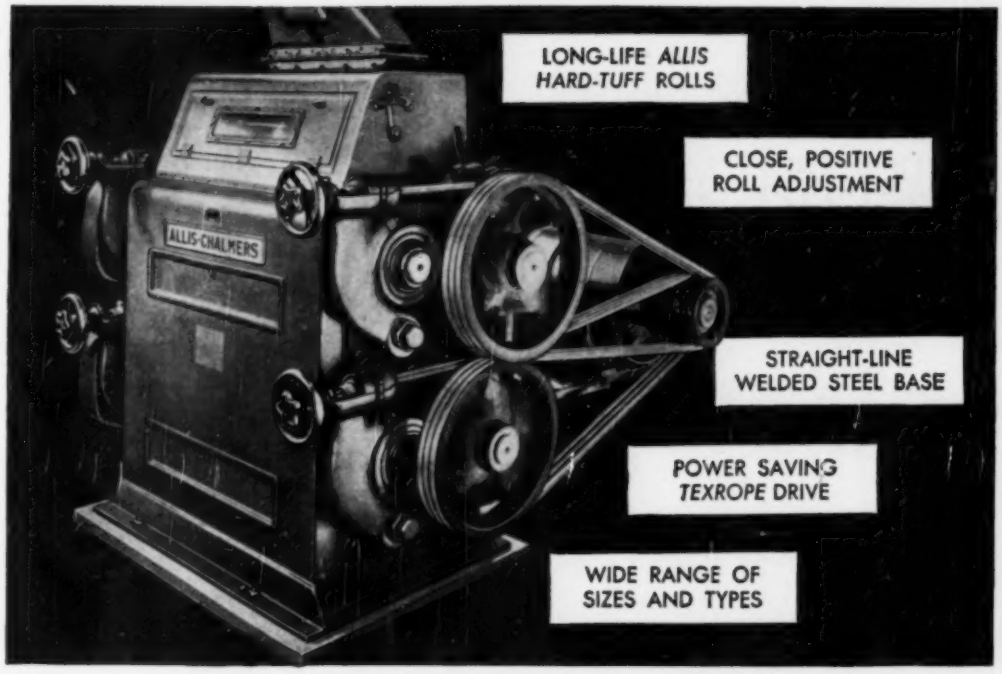
* Mixture contained 90 percent carbon tetrachloride and 10 percent ethylene dichloride by volume.

The Ni-Resist alloys can frequently be used with very dilute hydrochloric acid solutions at room temperature but not at elevated temperature. They show considerable superiority over cast iron under such conditions as indicated by the laboratory test data in Table III. Type 3 Ni-Resist (containing 28 to 32 percent nickel) usually is superior to Types 1 or 2 Ni-Resist because of its higher nickel content. Bubble caps and trays of Type 3 Ni-Resist are used in columns for the continuous rectification of carbon tetrachloride in the production of this material.

Nickel, Monel, Inconel and Ni-Resist are not subject to stress corrosion cracking in hydrochloric acid or chloride salt solutions. None of these alloys can be used with solutions of oxidizing acid chloride salts such as ferric chloride, cupric chloride and mercuric chloride except in extremely dilute solutions.

Nickel, Monel and Inconel are used to handle hydrogen chloride gas at high temperatures. Nickel and Inconel are usefully resistant for continuous service up to about 1,000 deg. F., Monel up to about 800 deg. F. and Type 1 Ni-Resist to about 500 deg. F.

(Further information can be obtained from Inco's Technical Bulletin T-29.—Ed.)



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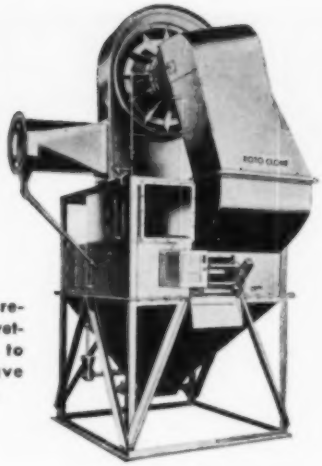
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NAMES IN THE NEWS



Man of the Month

H. N. Lyons

Henry N. Lyons, chemical engineer, has been appointed by the Economic Cooperation Administration to serve in Greece as assistant economic commissioner in its industry division. He will be concerned principally with the chemical industries both in the administration of ECA grants and in rehabilitation of domestic industries to supply home needs.

Mr. Lyons, who will be 56 next month, has had wide experience in the chemical engineering field. After he received his B.S. in chemical engineering from Pennsylvania State College in 1915, he joined Hercules Powder Co. His technical career has included, in addition to Hercules, positions with Columbia Chemical Division of Pittsburgh Plate Glass, Cities Service and Devoe & Raynolds. He resigned January 1 as research administrator at Devoe & Raynolds to accept the ECA appointment. He is a member of AIChE and ACS and is a registered professional engineer in New York.

Mr. and Mrs. Lyons and daughter Sally sailed for Athens on the Queen Mary January 26. They expect to be abroad for two years.

George E. Holbrook, formerly assistant director of Jackson Laboratory for the Du Pont company at Deep Water, N. J., has been appointed assistant plant manager for Chambers Works.

R. R. McClure has been appointed to the post of general superintendent of the pure calcium products division plant of Diamond Alkali Co., Painesville, Ohio.



R. R. McClure



R. L. Davies

Richard L. Davies is president of the firm, Pennsalt International Corp., a new subsidiary of Pennsylvania Salt Manufacturing Co. which was formed to take over the foreign interests of the parent company. **John H. S. Barr** is vice president.

George Black, formerly with International Nickel Co., is now with Cooper Alloy Foundry, Hillside, N. J., as manager of the public relations division.

Joseph J. Schaefer has resigned as director of development for Wyandotte Chemicals Corp. Dr. Schaefer will return to his business connections in the East.

E. C. Pattee has opened an office in Cincinnatti for establishing a consulting chemical engineering practice.

Richard S. Schreiber has been appointed associate director of research at the Upjohn Co., Kalamazoo, Mich. Since 1935 he has been employed as an organic chemist by E. I. du Pont de Nemours & Co., Wilmington, serving last as research supervisor in the experimental station.

Morris S. Kharasch, Carl William Eisendrath Professor of Chemistry at the University of Chicago, has been named recipient of the John Scott Award bestowed annually through the Board of Directors of City Trusts of Philadelphia. The award, consisting of $1,000 and a copper medal, was presented at a dinner of the Delaware section of the American Chemical Society on January 26.

R. Lindley Murray, vice president in charge of development and research for Hooker Electrochemical Co., has been promoted to executive vice president.



R. L. Murray



A. R. Bollaert

Armand R. Bollaert has been elected vice president in charge of the Great Lakes Carbon Corp.'s Dicalite division. Mr. Bollaert, manager of the division for the past year, was its former technical director.

Harry M. Hooker has retired as chairman of the board of Hooker Electrochemical Co., Niagara Falls, N. Y.

Warren K. Lewis, emeritus professor of chemical engineering at the Massachusetts Institute of Technology, has been selected to receive the 1949 gold medal of the American Institute of Chemists. Presentation of the medal to Dr. Lewis will be made at the annual meeting of the institute to be held in Chicago, May 6.

Thomas C. Reeves has been appointed to the eastern sales division staff of Oliver United Filters Inc. He was previously chief engineer of the Sherwin-Williams Co. plant at Bound Brook, N. J.

Heinz Heinemann, research chemist, has joined the staff of Houdry Process Corp. as a project director. Dr. Heinemann, whose headquarters are at the Houdry Laboratories, near

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Marcus Hook, Pa., joins Houdry after serving as research chemist and research supervisor with Attapulgus Clay Co., Camden, N. J.

L. W. Moore has been elected president of Pan American Refining Corp. and Mexican Petroleum Corp. of Georgia. **D. J. Smith**, president of Pan American Petroleum and Transport Co., the parent organization, has resigned as president of the two refining companies but will remain as chairman of the boards.

Irving A. Cole has been appointed manager of technical division by Attapulgus Clay Co. in the company's laboratories at Camden, N. J.


I. A. Cole


L. R. Strawn

Lynn R. Strawn, formerly of the Texas Co, at Port Arthur, has been appointed manager of the Neches plant of Jefferson Chemical Co.

Jim Huitt has been awarded the Magnolia Fellowship which was recently established in the school of chemical engineering at the University of Oklahoma. Mr. Huitt is a graduate of Louisiana Polytechnic Institute.

Maurice H. Bigelow has been appointed technical director of Plaskon division of Libbey-Owen-Ford Glass Co.

Bernard H. McGuiness, works manager of the Passaic, N. J., plant of Hewitt-Robins Inc., materials-handling machinery manufacturers, has been appointed vice president of the company's Robins Conveyors division.

Robert E. Barnett, an air pollution expert, has joined the staff of Sam Tour & Co., New York.

Harold F. Smiddy has been elected a vice president of the General Electric Co. Mr. Smiddy continues as general manager of both the company's chemical department at Pittsfield, Mass., and the air conditioning department at Bloomfield, N. J.

Roger E. Beal has been appointed safety engineer for the Monsanto Chemical Co., Everett, Mass. **Robert A. Devlin**, senior safety and fire prevention engineer at the Everett plant, continues responsible for coordinated fire and safety programs.

Fred W. Meyer has been named chief engineer of Bechtel Corp.'s engineering division.

H. R. Boehmer, general superintendent of the Sugar Creek, Mo., refinery of Standard Oil Co. (Indiana), has been promoted to manager to succeed the late **R. E. Beard**. **R. M. Cash**, superintendent of the process division at Sugar Creek, has succeeded Mr. Boehmer as general superintendent.

Harvey B. Mann became president of American Potash Institute on January 1, a promotion from the post of vice president and former manager of the Atlanta branch. **John W. Turrentine** who is succeeded by Dr. Mann continues a consulting connection with API as president emeritus.

James W. Pollard, Jr., has been named assistant superintendent of the Glidden Co.'s lithopone division in Baltimore.

Roscoe Hall Sawyer has been appointed assistant chemical director of Devoe & Raynolds Co. He will make his headquarters in Louisville.


R. H. Sawyer


E. J. Cleary

Edward J. Cleary has resigned as executive editor of *Engineering News-Record* to fill the newly created position of executive director and chief engineer of the Ohio River Valley Water Sanitation Commission.

Herman N. Hayden has been appointed vice president and general manager of the Wilmington Oil and Fertilizer Co., Wilmington, N. C. Prior to this appointment, Mr. Hayden was connected with the Virginia-Carolina Chemical Corp.

James W. McBain emeritus professor of chemistry at Stanford University, has accepted an appointment by the Central Government of India as director of the National Chemical



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C. W. Stewart has been elected president of Stancal Asphalt & Bitumuls Co., newly-created subsidiary of Standard Oil Co. of Calif. He was formerly head of American Bitumuls Co.

J. F. Schnacky has been transferred from the home office of Fischer & Porter to the Buffalo district office. He is now a district engineer and assistant to the head of the Buffalo territory.

L. S. DeAtley has been elected as chairman of the Kansas City section of the American Chemical Society for 1949. **C. L. Shrewsbury**, head of the agricultural chemistry division of the Midwest Research Institute, is the retiring chairman.

Leo B. Grant has been named manager of the New York sales office of the Dow Chemical Co. succeeding **Ralph E. Dorland** who held that position from 1919 until his death last May.

E. S. Coldwell has been elected president of Ford, Bacon & Davis succeeding **James F. Towers,** who will actively continue as chairman of the board of directors.

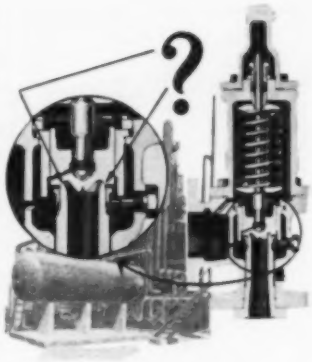
Milo A. Nice has been appointed assistant manager of Hercules Powder Co.'s explosives department's technical service division. **Arthur H. Sibley** succeeds Mr. Nice as assistant manager of the explosives department's New York office.

Daniel F. Reisenweber, a chemical engineer with U. S. Industrial Chemicals, Inc., has joined the Ground Force Munitions Branch, Munitions Division, Technical Command, Army Chemical Center, Md.

Howard S. Bergen has been appointed assistant coordinator of the plasticizers, resins and solvents group of the organic division development department of Monsanto Chemical Co., St. Louis.

George Yesse has been made chief process engineer, development department, Weyerhauser Timber Co., Longview, Wash. He was formerly in the engineering department of the Du Pont company.

Paul C. Cross has resigned as head of the chemistry department at Brown University to become head of the



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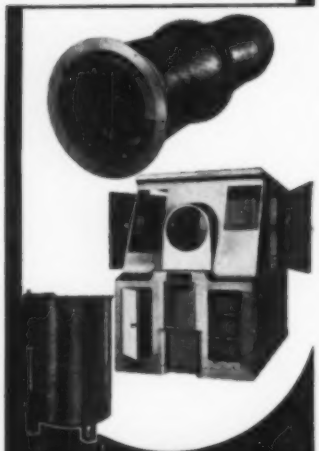
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chemistry and chemical engineering department at the University of Washington, Seattle, Wash. **Robert H. Cole** will become the new departmental chairman at Brown while **James S. Coles** will continue as executive officer. **Donald F. Hornig** is to be director of the Metcalf Research Laboratory.



G. E. Ziegler



C. O. Dohrenwend

George E. Ziegler has been appointed director and **Clayton O. Dohrenwend** assistant director of the Midwest Research Institute.

Edmund D. Wingfield has been elected vice president of Freeport Sulphur Co., and **E. H. McFarland** has been appointed general manager. Mr. Wingfield, a native of Virginia, has been general manager of the company for the past two years. He will continue to make his headquarters in New Orleans. Mr. McFarland has been assistant general manager, stationed in New Orleans.

Walter O. Snelling, consulting chemist and director of research of the Trojan Powder Co., Allentown, Pa., has been appointed to the Atomic Energy Commission's advisory committee on raw materials.

John W. Pegg has been named manager of the New York office of Shell Development Co., research affiliate of Shell Oil.

Hugo Klein has announced the opening of his practice as a consulting chemical engineer in Houston, Tex.

Donald H. Powers has been transferred from the Monsanto Chemical Co.'s Merrimac division textile department in Boston to the general development department in St. Louis.

Earl C. Chapin of Dayton, who joined Monsanto Chemical Co.'s central research department in 1944, has been transferred to the company's plastics division research department at Springfield, Mass. **C. H. Basdekis**, who has been with the plastics division's research department since 1942, has moved to cen-

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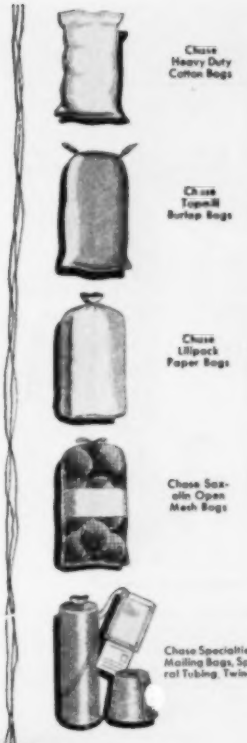
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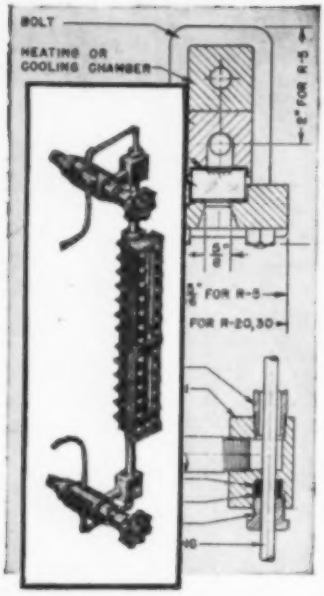
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tral research at Dayton. A new plastics application research group has been established at Dayton under the leadership of **Robert E. Cairns** of Springfield. Mr. Cairns will be assisted in his new undertaking by **Eli A. Haddad**.

Paul H. Scrutchfield has resigned from the Stamford laboratories of the American Cyanamid Co. and is now practicing as a consulting chemist with headquarters, Hannibal, Mo. Dr. Scrutchfield specializes in synthetic resins.

John R. Clopton, well-known chemist in the field of fats and oils, has joined the department of scientific research and technical development of Pillsbury Mills, Minneapolis, Minn.

James O. Clayton, research associate of the California Research Corp., has been appointed chairman of the Pacific Chemical Exposition, scheduled for November 1-5 at the San Francisco Civic Auditorium.

R. Spencer Soanes has been named president of the Scientific Instrument Makers' Association of Canada, with **J. Subko** as vice president and **H. L. Roe** as secretary treasurer.

Paul M. Gross, nationally prominent chemist and dean of the Duke University graduate school, has been elected vice president of the university.

L. L. Hedgepeth, formerly executive secretary of the Virginia State Water Control Board, has joined the American Cyanamid Co. as consulting engineer on industrial effluent problems and will make his headquarters at the Bound Brook, N. J. plant of the company's Calco chemical division.

Laurence D. Gibson for nearly 20 years vice president and chief chemist, Cunningham Cleanser Corp., New York, has joined Wollen Chemical and Supply Co., Patterson, N. J., as technical director and production manager.

William A. Bittenbender has been appointed director of the technical development department of Merck & Co. Dr. Bittenbender had previously held the position of assistant director of the technical development department.

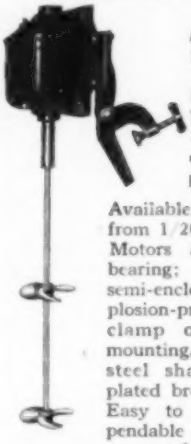
E. Duer Reeves, a vice president and director of Standard Oil Development Co. since 1947, has been appointed executive vice president,

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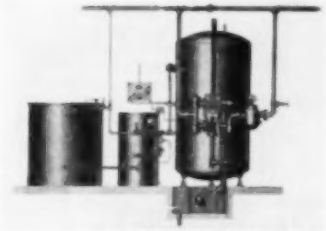
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and **Edwin J. Gohr**, assistant manager of the research and development department since 1945, is now a vice president and a director.

Ray O. Vandapool has been appointed branch manager for Abbott Laboratories at Denver, Colo.

Roger Adams, head of the department of chemistry at the University of Illinois, has been elected president-elect of the American Association for the Advancement of Science.



J. P. Kleber



G. L. Illig, Jr.

John P. Kleber has been named manager, division of municipal and process waters, Calgon, Inc., Pittsburgh, succeeding **Owen Rice**, who was recently elected vice president in charge of industrial chemical sales. Named as Mr. Kleber's assistant was **George L. Illig, Jr.**, who has been engaged in development and pilot plant work in this division of Calgon, Inc., since his return from military service two years ago.

James W. Foley has been appointed assistant to vice president R. Ogarrio of the Texas Co.'s domestic producing department. He was formerly assistant division manager at Tulsa, and will now make his headquarters at New York.

Hermann W. Mahr has retired from his position as production manager with the fine chemicals division of E. I. du Pont de Nemours & Co., Wilmington, and has since become a member of the National Security Resources Board.

Harvey Diehl, professor of chemistry at Iowa State College, has been named to the committee on national meetings and divisional activities of the American Chemical Society for the years 1949-51.

J. A. Murray, J. Kenson Simons and **David E. Cordier** will fill new positions as associate directors of research in the Plaskon division of Libbey-Owens-Ford Glass Co. Dr. Murray will be concerned particularly with direction of research on glues and industrial resins. Dr. Simons will direct fundamental

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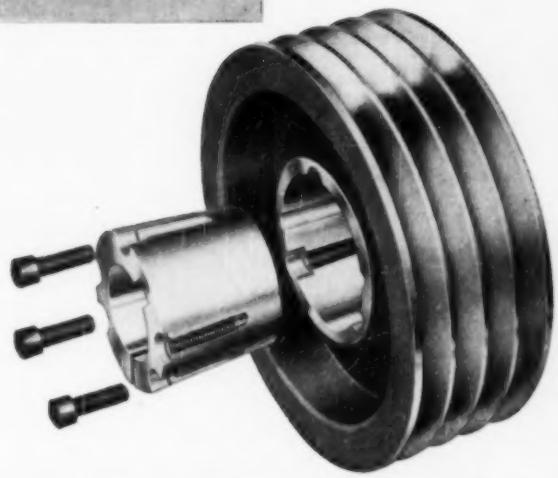
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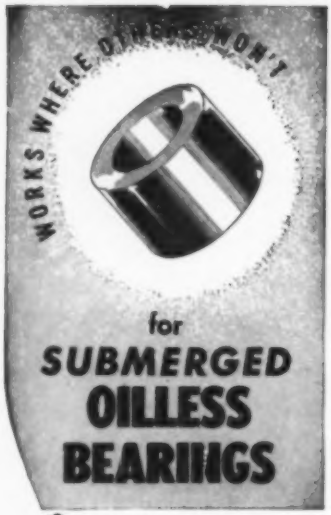
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chemical research, and Mr. Cordier will be concerned primarily with molding compound research.

Theodore M. Vial, who recently completed work for a Ph.D. in organic chemistry at the University of Illinois, has joined the research staff of Chas. Pfizer & Co. at their Brooklyn plant.

William E. Shoupp, nuclear physicist, has been named director of research for the Westinghouse Electric Corp.'s new atomic power division. **Robert A. Bowman,** engineer especially familiar with heat transfer and ship propulsion problems, was appointed manager of engineering.

John S. Wilson has been appointed personnel manager for the chemical division, Corn Products Refining Co., Argo, Ill. He has most recently been a section leader in the engineering department of the chemical division.

John E. Swearingen has become executive assistant to the vice president in charge of operations for Stanolind Oil & Gas Co. at Tulsa. **G. F. Moore** has been named assistant operation superintendent of the company's manufacturing department.

E. G. E. Shafer has been appointed director of product control of Hoffmann-La Roche Inc. Mr. Shafer's responsibility embraces the control of all products produced for sale by this company.

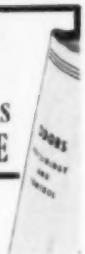
Frank B. Jewett, formerly chairman of the board, Bell Telephone Laboratories, and formerly president of the National Academy of Sciences, has accepted an appointment as a member of the board of trustees of Battelle Institute, Columbus, Ohio. Dr. Jewett will fill a vacancy created by the death of **Rolland C. Allen,** Cleveland industrialist.

George B. Coale has been appointed chief engineer of National Lead Co. succeeding **Andrew Mayer,** retired.

Harold G. Deters of Cawker City, Kan., has joined the chemicals division of General Electric's chemical department as assistant sales manager of alkyd resin products with offices at Schenectady.

Lawrence R. Hafstad has been appointed director of the reactor development division of the U. S. Atomic Energy Commission. He is the first director of this new division which was created in August 1948. Dr. Hafstad has been on leave of

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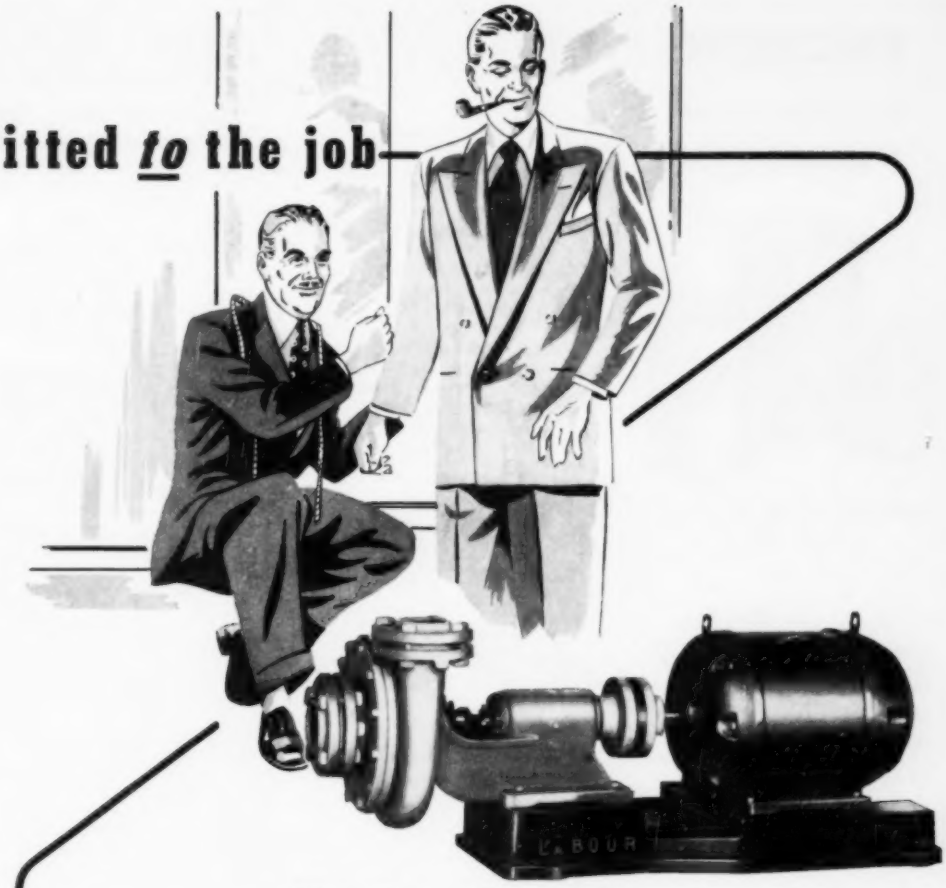
3 Principles of HIGH-POLYMER THEORY and PRACTICE
By A. X. SCHMIDT,
Asst. Prof. in Chemical Engineering, and
C. A. MARLIES,
Assoc. Prof. in Chemical Engineering, C.C.N.Y.
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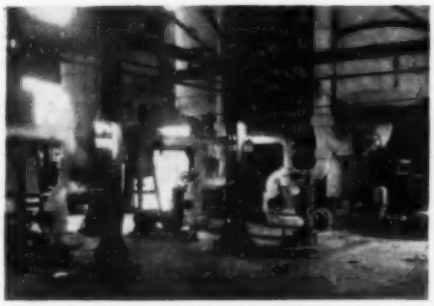
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absence from Johns Hopkins University where he holds the position of director of research of the applied physics laboratory at Silver Spring, Md.

Per K. Frolich, director of research and development for Merck & Co., has been appointed vice president for research and development.

Ralph Talbot Goodwin, manager of Shell Oil Co.'s aviation department since 1941, has been named manager of the company's special products department in New York to succeed **R. S. Mitchell.** The latter has been appointed head of the company's St. Louis marketing division. Dr. Goodwin has been active in the field of organic chemistry and petroleum technology for the past 25 years and has been with Shell since 1932.



R. T. Goodwin



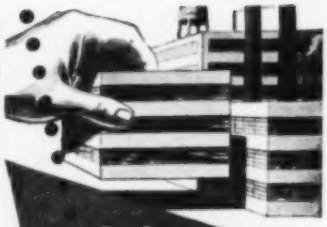
J. E. McKeen

John E. McKeen, formerly vice president in charge of all of the Chas. Pfizer & Co. plants, has been named to the newly created position of executive vice president. **Fred J. Stock** has been named vice president in charge of sales. **John L. Davenport,** formerly secretary and general superintendent of the company, has been promoted to vice president in charge of production.

Sheldon Sneyd has been named chairman of the Chemical Institute of Canada (Toronto Branch). Others chosen include **Geoffrey K. Wright,** vice chairman; **W. A. Smithers,** secretary, and **Clyde C. Meinhoefer,** treasurer.

T. L. B. Lyster, chief engineer of the Hooker Electrochemical Co., has retired. Mr. Lyster will continue his service to the company as consulting engineer. **E. K. Newton** has been appointed chief engineer.

William L. Belvin, formerly professor of chemical engineering at the University of Arkansas, has joined the Southern Research Institute, Birmingham, Ala., as a chemical engineer. Other recent additions include **Walter H. Cobbs, Jr.,** in the



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physical chemistry division and **Peyton Wheeler** in the applied chemistry division.

Guitta Blau has joined the staff of Bjorksten Research Laboratories at their newly established branch in Madison, Wis.

Eugene L. McCarthy, Corpus Christi, Tex., has been awarded the Black, Sivalls and Bryson fellowship, at the University of Oklahoma.

Glenn P. Roddey has been appointed manager of the Rock Hill, S. C., plant of Warwick Chemical Co., division of Sun Chemical Corp. He succeeds **Peter M. Shonk,** who has joined the Aridye division of Interchemical Corp. in New Jersey.

Osgood V. Tracy has been appointed manager of the chemical products department of Esso Standard Oil Co. He has been assistant manager of the department.

A. C. Atwater has joined the staff of Thomas Bryan & Associates, Houston, Tex., as manager of the petroleum and chemical division.

OBITUARIES

Peter T. Ingram, 59, president of Gane and Ingram, Inc., Gane's Chemical Works, Inc., A. Maschmeijer, Jr., Inc., and Chemical Industries, Inc., died December 17.

Leo W. Knapp, 58, sales engineer with Oliver United Filters, died in Pennsylvania December 18.

David P. Graham, vice president of Peabody Engineering Corp., New York, died December 18.

Albert K. Epstein, 58, president, Emulsol Corp., Chicago; president, American Palestine Trading Corp., New York; and member, Epstein, Reynolds and Harris, Chicago, died in Tel Aviv December 22.

John L. Foulke, 48, chief chemist of A. & M. Karagheusian, Inc., New York, died December 24.

William H. Rihl, sales engineer for Proctor & Schwartz, died December 29.

Ross C. Purdy, 73, nationally known ceramic engineer, died in Columbus January 6.

Charles A. Marlies, 43, associate professor of chemical engineering at the College of the City of New York, died January 13.



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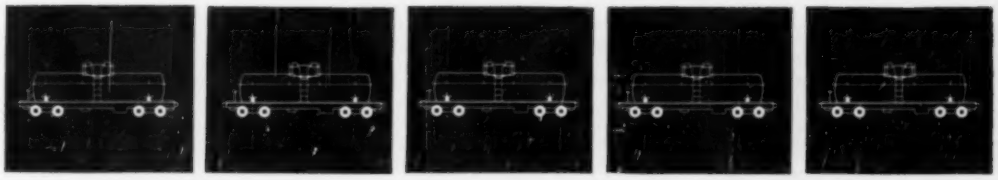


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pure, uniform caustic soda



to meet your strictest requirements

Wyandotte Caustic Soda, as produced by the Mercury Cell method, meets the highest standards of quality. Commercially, it is free from sodium chloride, sodium chlorate, iron and practically all other impurities.

In the manufacture of rayon and other products—wherever high-grade caustic soda is essential—this truly fine chemical can be used as *delivered*, without further processing. Its purity and uniformity do not depend upon the efficiency of a purification system.

Recently completed facilities have enabled us to double our previous production of Mercury Cell Caustic. If your chemical needs include quality caustic soda, why not write us today?

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CHLORINE • HYDROGEN • DRY ICE
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AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

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Fabricated by specialists in corrosion-resisting equipment

YOUR very first impression of any METALSMITHS utensil is "quality". You can see it in the design, the workmanship, the durable construction. These extra values pay off in longer service and lower cost.

COMPLETE LINE—PROMPT SHIPMENT

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Division of

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564 White Street

Orange, N. J.

INDUSTRIAL NOTES

Sewall Paint & Varnish Co., Kansas City, Mo., has appointed Fred Cummins manager of trade sales and factory branch offices, with headquarters in Kansas City.

E. I. du Pont de Nemours & Co., Wilmington, has made W. James Latimore assistant district sales manager of the Houston-New Orleans district with headquarters at Houston.

American Mineral Spirits Co., Chicago, has appointed Clyde C. McInnes manager of the extraction solvents division.

Monsanto Chemical Co., St. Louis, has made R. H. Baugh general branch manager of its Cleveland office. Sam F. Teague Jr. has been named assistant branch manager at Cleveland.

Joseph T. Ryerson & Son, Inc., Chicago, has elected William Seymour, Jr., vice president, C. L. Hardy, assistant vice president, and Thomas G. Miller, secretary.

Kinney Manufacturing Co., Boston, has made Robert C. Webster general sales manager. William F. Worcester has been made vice president and will act as consultant to the sales and engineering departments.

Stehli & Co., New York, has retained Frederick H. Rhodes to organize and manage an industrial products division.

Automatic Switch Co., Orange, N. J., has appointed F. P. Spinelli manager of the switch department and R. F. McCormick manager of solenoid valve sales.

Vapor Recovery Systems Co. has relocated its Cleveland offices at 719 Gulf Bldg., Pittsburgh, Pa. J. R. Edwards, Jr., will be in charge of this more strategically located branch office.

Cincinnati Milling Machine Co., Cincinnati, has acquired controlling interest in the Carlisle Chemical Works, Inc., Reading, Pa.

Sharp & Dohme, Inc., Philadelphia, has elected John G. Bill vice president in charge of domestic sales.

McKesson & Robbins Inc., New York, has appointed Walter M. Burgess assistant manager of the New York

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Capacity—from 1 pt. to 2500 gals.





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chemical department. Alexander Brisbane has replaced Mr. Burgess as New Jersey sales representative.

American Cyanamid Co., New York, has made James Dixon manager of the dyestuff department, at the Calco division's Philadelphia's branch.

Alan A. Wood, Inc., Philadelphia, has been formed to sell and service boiler and similar equipment in the Philadelphia area.

Eastman Kodak Co., Rochester, N. Y., has named William E. Barr general manager of its sensitized goods sales division.

Bemis Bro. Bag Co., St. Louis, has made Howard L. Bayne manager of the Kansas City plant.

Diamond Alkali Co., Cleveland, has made C. S. Hancock manager of calcium carbonate sales. John A. Sargent has been elected executive vice president.

Koppers Co., Inc., Pittsburgh, has made R. R. Holmes assistant general manager of its tar products division.

Standard Wholesale Phosphate and Acid Works, Baltimore, has begun operation of a large single unit, sulphur burning, contact sulphuric acid plant. Capable of producing 500 tons of acid per day, the unit was designed and built by Chemical Construction Corp.

Continental Can Co., New York, has named R. L. Perin general sales manager.

Electric Storage Battery Co., Philadelphia, has appointed Robert L. Sommerville assistant general sales manager.

Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, has appointed Philip J. Lindner to head its Detroit branch sales office.

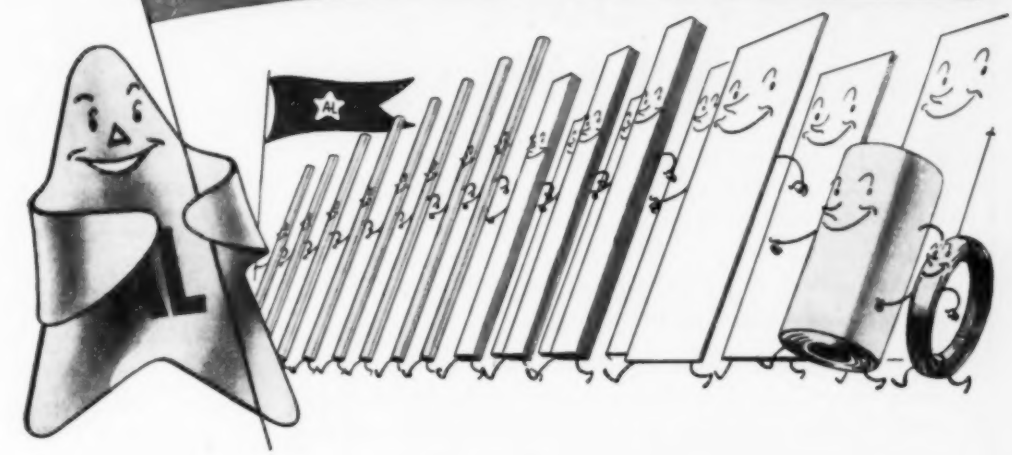
General Aniline & Film Corp., New York, has made James Forrestal general manager of its Ozalid division.

H. K. Ferguson Co., Cleveland, has established a western district office in Los Angeles managed by Henry Maag.

Sterling-Winthrop Research Institute, Rensselaer, N. Y., has named John Hart head of its new products development division.

American Viscose Corp., New York, has added Thomas H. Derby to the market development department of Sylvania division. Richard E. Rey-

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Data on the Uses of ALLEGHENY METAL in Various Industries

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Let us handle *your* requirements. Full technical or fabricating data, and personal engineering help, are yours for the asking.

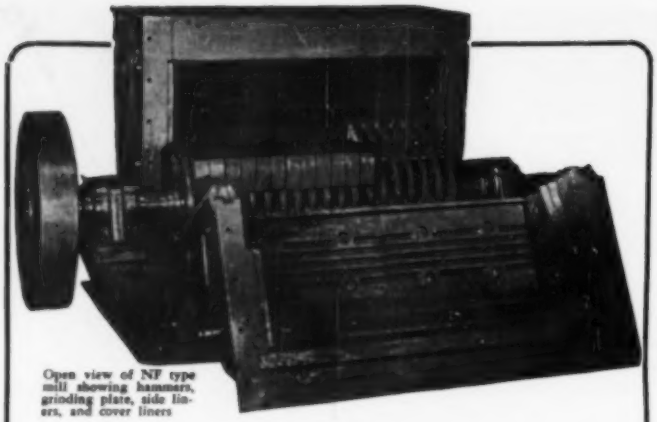
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Open view of NF type mill showing hammers, grinding plate, side liners, and cover liners

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nolds has been made branch manager of the Atlanta, Ga., office.

Puromat Co., Chicago, has been formed to build and develop automatic liquid purifiers for the water and process industries. Frank D. Prager is president.

Taylor Forge & Pipe Works, Chicago, has appointed Thomas J. Lingle western division manager in charge of manufacturing operations at its new Fontana, Calif., plant.

E. I. du Pont de Nemours & Co., Wilmington, has named Charles T. Mentzer, Jr., sales supervisor in the organic chemicals department's New York office.

Abbott Laboratories has moved into its new one-story brick building at 730 Ponce de Leon Ave., Atlanta, Ga.

Ferro Enamel Corp., Cleveland, has appointed Herman L. Cook to its sales and service organization.

Lithgow Corp., New York, has opened a new Lithcote plant at Norwalk, Conn.

Eastman Kodak Co., Rochester, N. Y., has appointed Paul A. Barbee assistant manager of the industrial photographic sales division.

Virginia Smelting Co., West Norfolk, Va., has moved its New York offices to 270 Madison Ave.

Blaw-Knox Construction Co., Pittsburgh, has named Edson W. Forker president and George E. Kopetz and Ralph E. Moser vice presidents of the chemical plants division.

Instruments, Inc., Tulsa, has made O. W. Graham its president.

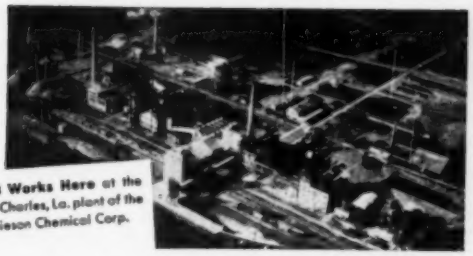
Fisher Governor Co., Marshalltown, Iowa, has appointed A. E. Ehrke & Co. as its district sales representative in the Cleveland area.

Glidden Co., Cleveland, has made Robert B. Anderson Chicago sales representative for the chemical and pigment division.

Bowser, Inc., Fort Wayne, Ind., has elected Fred S. Ehrman vice president and director of sales.

Glidden Co., Cleveland, plans to expand and modernize its naval stores division at Valdosta, Ga.

B. F. Goodrich Chemical Co., Cleveland, will be ready to go into large scale production of plasticizers in the



4+8 Works Here at the Lake Charles, La. plant of the Mathieson Chemical Corp.



4+8 Works Here at the Kodak Park plant of Eastman Kodak Co., Rochester, N.Y.

alkali OR FILMS



4+8 Works Here at the Chillicothe, Ohio Mill of the Mead Corporation.



4+8 Works Here at the Midland, Michigan plant of The Dow Chemical Company.

paper OR CHEMICALS

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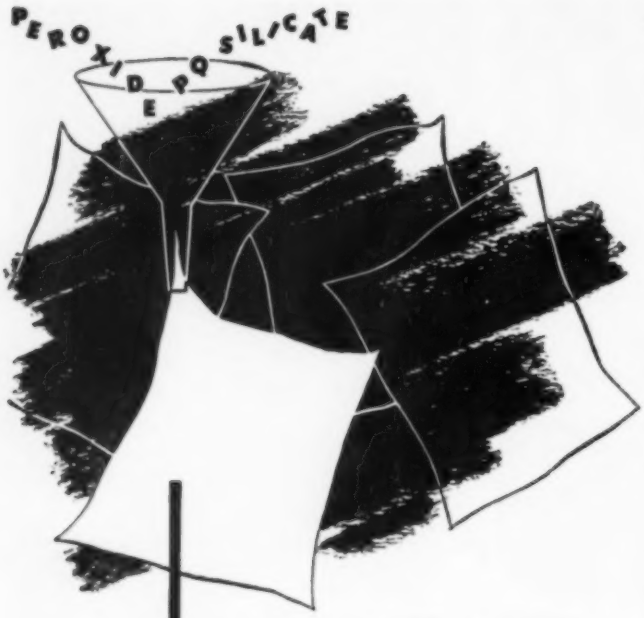
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peroxide & PQ silicate

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Now, groundwood pulp is bleached to the same brightness of more expensive types with the aid of peroxide and PQ Silicate. In one mill, for example, at a consistency of 12% and 1.5% sodium peroxide, the brightness of a groundwood-sulphite pulp was increased seven points on the GE reflection meter.

PQ Silicate acts as a buffer to maintain constant pH in the bleach bath, prevents loss of oxygen when no bleachable material is present, aids the bleach liquor in penetrating into the fiber.

The degree of improved whiteness depends on various factors—the type of pulp, the amount of peroxide, etc. We shall be pleased to discuss your bleaching problem.

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For over 80 years, PQ research has been devoted to the development and improvement of silicates of soda for industry. Let's talk over your process whether it involves bleaching, cleansing, or a binding use of silicate.

PQ SILICATES OF SODA

$3 million plant at Avon, Ohio, by April 1.

Pennsylvania Crusher Co., Philadelphia, has acquired exclusive manufacturing and sales rights in eastern United States and Canada covering the Kue-Ken line of jaw crushers and gyratory crushers.

Hauser Chemical & Supply Co., Toledo, has formed the Hauser Products Sales Co. which will be exclusive Toledo area sales agent for its industrial and sanitary chemicals.

General Aniline & Film Corp., New York, has reported net earnings after taxes for the third quarter of 1948 of $3,300,000.

Wyandotte Chemicals Corp., Wyandotte, Mich., has acquired the manufacturing facilities and clay deposits of Blue Mountain Clay Co. in Mississippi.

Kennecott Copper Corp. has awarded a lead construction contract covering the installation of between five and six million pounds of sheet lead, lead pipe and other lead apparatus at Garfield, Utah, to the Andrews Knapp Construction Co., New York.

Hanson-Van Winkle-Muning Co., Matawan, N. J., has opened an electroplating laboratory.

Hexagon Laboratories, Bronx, N. Y., has begun full scale production of p-amino-salicyclic acid.

Dixie Machinery Mfg. Co., St. Louis, Mo., has added David P. Swan to its staff in the capacity of field engineer and to assist in general sales promotion.

E. I. du Pont de Nemours & Co., Wilmington, has appointed Wallace E. Gordon assistant director of sales in charge of agricultural chemicals, adhesives, resale chemicals and zinc products in the Grasselli chemicals department.

Tennessee Eastmen Corp., Kingsport, Tenn., has appointed D. B. Campbell, Jr., its chemicals representative in Cleveland.

United States Rubber Co., New York, has made Herbert E. Smith chairman of the board and chief executive officer. Harry E. Humphreys, Jr., succeeds him as president.

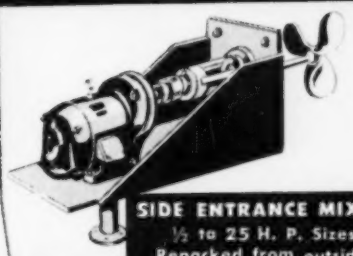
Jessop Steel Co., Washington, Pa., has named Jonathan D. Freeze district sales manager of the New York territory.

"International"

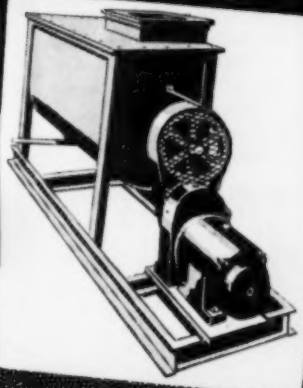
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MIXERS AND KETTLES
Complete with Tank and Drive Unit, in various types and sizes, with any style stirrers, propellers or turbine.



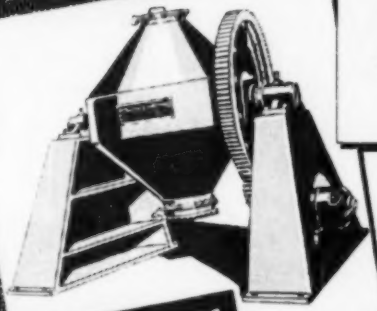
SIDE ENTRANCE MIXERS
½ to 25 H. P. Sizes
Repacked from outside.



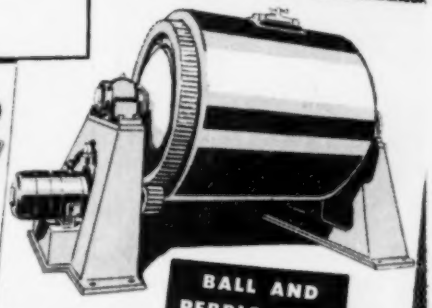
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CONVENTION PAPER ABSTRACTS

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NUCLEONICS

More About Secrecy

Frank H. Spedding

EXCESSIVELY stringent secrecy restrictions based on emotional ignorance are a threat to American supremacy in science and engineering. Peacetime applications of atomic energy in the long run will so far outstrip the destructive uses that the latter will be minor.

We can visualize the use of atomic energy as a research tool, as a source of power, and in a number of other applications. The really great applications which it is bound to bring about have not yet been envisioned.

There is no "atomic secret" that could be purloined by a secret agent and turned over to an enemy of the United States. The real secret of how to produce an atomic bomb or an industrial power plant lies in the extensive scientific and industrial know-how which our scientists and engineers possess as part of their heritage and education. The real secret is not in how the bomb or power plant operates, but in how to carry out these operations on a large scale so as to make them effective.

This country is in real danger, from the national safety angle alone, of losing its lead in the scientific world due to the emotional approach to the question of secrecy which is so prevalent in certain quarters of our society. Our scientists and engineers, if unhampered, can keep well ahead of those of any other nation.

There is no question that military matters, the design of weapons, and the design of larger scale production

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JACKSON & CHURCH COMPANY'S ZENITH CONTINUOUS PULP PRESS offers GREATER efficiency and GREATER profits . . . with the hydraulically operated cake discharge port or "floating cone."

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Constant development of scientific principles through research is the order of the day at Brown & Root. Conventional methods of construction are thoroughly exploited for improvement. Modern industrialists know therefore the latest and best in engineering "know-how"-through-research is available always for their construction needs.

Large industrial, chemical and petro-chemical plants throughout the world attest to Brown & Root's skill in doing a complete job for their clients. Staffed by experts in economic planning, engineering design and erection, Brown & Root solves all construction problems from site location to operating plant.

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CLEAR LIQUIDS AT LOW COST



Fig. 3769

APPLICATIONS: Ideal for clear liquids, general water supply, circulating, transfer service, air conditioning, irrigation, and similar uses.

ADVANTAGES: Advanced design gives you compact simple construction with high operating efficiency, ease of installation and maintenance, and unusually low prices considering ratings and quality.

SIZES: Available in 14 sizes for both motor and belt drives. Capacities from 10 to 1800 GPM with heads to 120 ft. Available in standard fitted and all iron construction.

Write for Bulletin 622-A-2 today for complete details on this new centrifugal for clear liquids.

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Dept. CE, SENECA FALLS, N. Y.

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plants should be kept secret until a workable international control scheme has been put into effect. But what should be made public should be left to the scientific and technical people, and not be determined as the result of emotional ignorance.

If scientists and engineers are frightened into remaining silent about those phases of atomic energy which are not real secrets—by witch hunts or by public pressure stemming from ignorance—then these phases will lag. In the long run this will do serious harm to the nation.

Frank H. Spedding, Iowa State College Institute for Atomic Research, before Iowa Section, American Chemical Society, Iowa City, Dec. 3, 1948.

POWER

Survey of Electrification Opportunities in Industry

F. W. McChesney

BY FAR the largest single proportion of electric energy generated in the United States today is the industrial load. In 1947 industry used 151 billion kilowatt hours, or 56.5 percent of all power generated. Energy generated by utilities in the last 22 years has increased from 61 to 256 billion kilowatt hours, and according to our charts climbs steadily upward to over 400 billion in 1955.

There are three major reasons for this phenomenal growth. First is the steady growth of population: a 35 percent increase since 1920; a probable total of 160 million by 1955. Second, we produce more goods per man because we use more power per man. In 1944 the average production worker had three times as much mechanical help at his disposal as at the turn of the century. Each worker in 1947 was using approximately 11,000 kwh. The third factor sometimes overlaps the second. Not only does each worker produce more (because of greater use of power), but each unit of production—whether it be refrigerators or barrels of cement—contains more kilowatt hours. From 1939 to 1947 the electric energy per unit of production went up 10 percent.

The Far West has led all other sections in population growth since 1940. In the last eight years California has increased its population by 3,124,000 to give a total of 10,031,000. Considering California's rapid growth, civilian employment has maintained healthy progress. From April 1940 through May 1947 the total employment rose from over 2,500,000 to some 3,600,000. Unlike earlier times, the shift westward today is to the



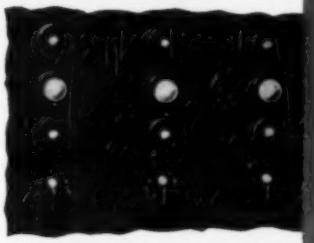
Three 3-Light *Visularms* Mounted in a Horizontal Row with Back Feed Conduit Arrangement. Rear View of Panel and Cover Removed.

The NEW *Explosion-Proof* *Visularm* CONDULETS*

safeguard continuous production
by instant warning of abnormal conditions

1. **Pilot lights** give visual indications of normal and abnormal temperature, pressure, liquid level, speed, load or other conditions.
2. **Bell or howler** can be used to give an audible signal. A single bell or howler can serve any number of *Visularms*.
3. **Flashing light** instantly directs attention to the proper control station.
4. **Reset-Test Switch.** "Reset" position silences audible signal and changes flashing light to steady until normal operation is restored. "Test" position permits periodic check of each element in the *Visularm*.
5. **Compact and easy to install.** Occupies little space on the control panel. Only requires round drilled holes.
6. **Accessible** . . . . all actuating devices are on a factory-wired, jack-mounted plate which can be quickly removed for servicing and a spare can be inserted to maintain operation.
7. **Flame-tight threaded joints** on all openings . . . give maximum protection with quick and easy access.
8. **Two-light and three-light** *Visularms* are available; any number can be mounted in either vertical or horizontal rows on a control panel.

Listed on new Pages 12L through 12P, Section 85, Condulet Catalog 2500.



Front View of the Panel Illustrated Above with Three 3-Light *Visularms* Mounted in a Horizontal Row.

**CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

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For years, the process industries have depended upon I•P•E for agitation requirements because of:

- I•P•E's expert engineering approach to agitation problems—based on wide processing experience.
- I•P•E's dependable specifications for the type of agitator to best fit the job.
- The delivery of an agitator that will do its required work well—and long.

Prominent among the I•P•E "Standard-Plus" units because of its wide adaptability, is the

I•P•E TURBINE AGITATOR

—for dissolving, mixing and combination operations where high heat transfer rates are required. Successfully handles suspended materials in relatively high viscosity solutions.

In these operations, no single type of blade will meet all needs. I•P•E offers three styles for selection—each with its own particular function. Pitched blades for a high degree of axial flow motion; Curved blades for radial flow characteristics; Curved and Pitched blades in one unit for combination flow.

An added feature is the use of proper bearings and drives in accord with varying conditions.

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1797

Other I•P•E Units Include

Agitators: Side-Entering Propeller Type, Top-Entering Propeller Type, Anchor Type, Paddle Type, Vertical Finger Type. Agitator Drives: Vertical, Right Angle Vertical. Processing Reactors, Kettles, Stills, Autoclaves, Absorbers, Dissolvers, Digesters, Crutchers, Dryers, Blenders, Crystallizers, Extruders, Condensers, Heat Exchangers, Mixers, etc.

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states in which new industries sprang up during the war. The number of new manufacturing plants either undertaken or announced in California during 1945-46 and the first eight months of 1947 reached the amazing total of 2,610. A comparison of the years 1939 and 1946 shows a rise in all manufactured products for California from $2,798,000,000 to $7,443,000,000, ample proof of a substantial future.

F. W. McChesney, General Electric Co., before Industrial Power Conference, Berkeley, Calif., Nov. 4, 1948.

MANAGEMENT

Replacement Reserves

A. B. Hossack

With every unit of production a portion of the depreciable plant is used up either as a result of wear or the element of time. If a business is going to continue it must provide the funds to assure the replacement of the tools of production either from earnings or by new capital. Recovery of cost will no longer provide sufficient capital to make possible the replacements. Current production costs should include a charge sufficient each year to provide in present dollars for that portion of the plant currently used up in service.

It is necessary to be practical in approaching the determination of the proper annual depreciation charges on replacement costs. Estimating a rate of depreciation either for units or groups is not subject to exact determination. Unnecessary refinement in the replacement computations at prohibitive cost is not warranted. You must, if your procedure is to be effective, follow the price changes in future years and annual redetermination of replacement cost in detail is not economically practical. Your follow through in subsequent years should endeavor to gage the major swings, upward or downward, as conditions change.

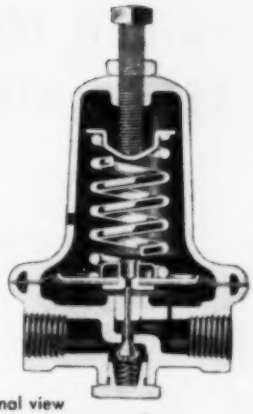
For most properties there are important major units that control the larger percent of the total investment. If these are reasonably controlled, the same averages can be applied to the minor facilities, and give results within practical limitations. It is desirable to have a replacement reserve into which would be credited the excess of the depreciation computed on cost that is charged against current operations.

There are special cases where concerns are faced during this postwar period with substantial reconstruction, rehabilitation, or replacements, often involving substantial outlays. Where such conditions exist, it is often desired to budget ahead the funds re-



The Fisher Series 67 Regulator for small volume air or gas flows is designed to furnish industry with an improved economical regulator with the ability to do an outstanding job of **accurate, efficient regulation.** It will not vibrate, chatter or sing and has capacity up to 6 C.F.M.

Fisher Series 67 Regulators are ideal for hundreds of miscellaneous industrial uses—they are particularly adapted to instrument air service, supplying 20 lbs. operating medium pressure to instruments and pilot operated regulators.



Type 67 exterier view with handwheel adjusting screw.

Type 67R sectional view with integral relief valve.

FISHER SERIES 67 SMALL VOLUME REGULATORS

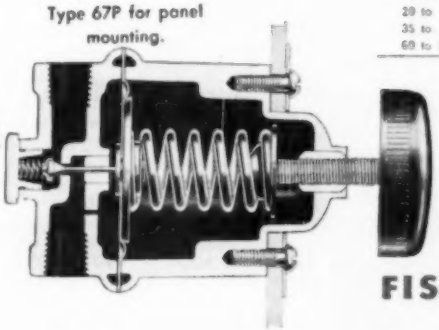


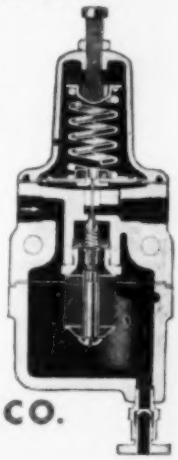
Type 67FR combination filter—regulator. Drip section equally efficient in horizontal or vertical position. Filter—finest perforation area—0.002"

CAPACITY DATA

Reduced Pressure Ranges, PSI	Maximum Capacity CFH Free Air at Reduced Range with 10% Droop Factor at Inlet Pressure of:		
	50 PSI	100 PSI	250 PSI
5 to 20	350	750	1400
20 to 35	400	750	1400
35 to 60	125	450	1400
60 to 100		350	900

Type 67P for panel mounting.





SPECIFICATIONS:

Size—¼".

Maximum inlet pressure—250 PSI.

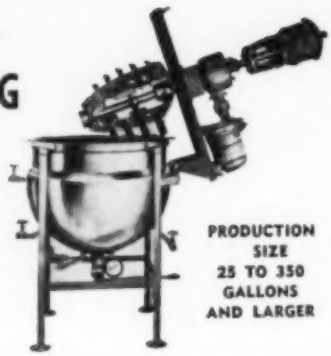
Body—Aluminum, alodine finish and painted.

Dimension—Over all height 5 5-16"—(67FR 9 3-8") face to face 2 7-8".

For further details and complete specifications write for Fisher Bulletin 67.

FISHER GOVERNOR CO.
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A NEW TOOL
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TWO MIXERS
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SIZE
25 TO 350
GALLONS
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The new AGI-MIXER (incorporating our HOMO-MIXER) gives a FINER mix than any other apparatus, frequently in 1/10th the time. Material is agitated slowly by the paddles of AGI-MIXER, being worked downward to the HOMO-MIXER, which mixes and shears at high speed and pressure. This produces particles of extremely fine size, which are ejected upward again to the AGItator paddles. Thick heavy viscous mixtures can be mixed and homogenized at the same time. We furnish complete outfit, including motors and kettle. Sizes from laboratory to production plant.

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quired. Where such conditions occur, it is often desirable to rather carefully review the property to be replaced and its cost in comparison with present prices. The excess cost is often set up as reserve appropriation from surplus, or if the program takes some time, provided in annual surplus appropriations. These are special studies for the information of management or as explanation to stockholders for the withholding of portions of the earnings.

If such a reserve is established, it should be done in connection with a definite plan for the utilization of this reserve from time to time as replacements are made. It is undesirable merely to set up this reserve and to hope later that there may be sufficient decrease in prices so that the depreciation on replacement costs will be less than on original costs, and thus provide a means of ultimately reducing the replacement reserve established. Retirements against this replacement reserve should be made from time to time as original property is actually retired from service and replaced either with comparable facilities or with other facilities to render an equivalent function.

If substantial retirements are made, the reserves established might be insufficient to provide for the charges, but certainly the amounts already provided would be helpful in meeting the funds required. This procedure also has a definite advantage that this reserve would not be a one-way account. Funds retained in the business would be used for the purpose for which they are set up, namely to insure or to assist in part in maintaining the facilities required for the continuity of the business.

A. B. Hossack, American Appraisal Co., before the American Gas Association, Atlantic City, Oct. 4-8, 1948.

NUCLEONICS

New Analytical Tool

T. Ivan Taylor

The conspicuous appetite of many of the heavier metals for neutrons traveling at certain speeds serves to identify the metals and to tell accurately in what amounts they are present. This phenomenon, known as resonance absorption, might be applied to measure the thickness of gold, silver, or cadmium plating. An automatic machine could be designed and installed on assembly lines for this purpose.

Another likely application would be the detection of trace amounts of the metal indium in tin. Although for most purposes impurities of indium would be of little consequence,

SINGLE! DOUBLE! TRIPLE!

. . . . *Every type of Herringbone Speed Reducer that you might need*

Jones Herringbone Gear Speed Reducers are built in a wide range of ratios and ratings to cover every requirement. Single (Type SH) reducers in standard ratios range from 1.25 to 1 up to 11 to 1 in ratings from 1.3 to 440 H.P. Double (Type DH) reducers are built in standard ratios from 10.9 to 1 up to 72 to 1 in ratings from 0.5 to 275 H.P. The triple reduction reducers (Type TH) cover a range of ratios from 86.9 to 1 up to 355.8 to 1 in ratings from 0.3 to 78 H.P.

All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Cast iron bases are available for all variations of motor assembly. Liberal stocks are carried to facilitate shipments.

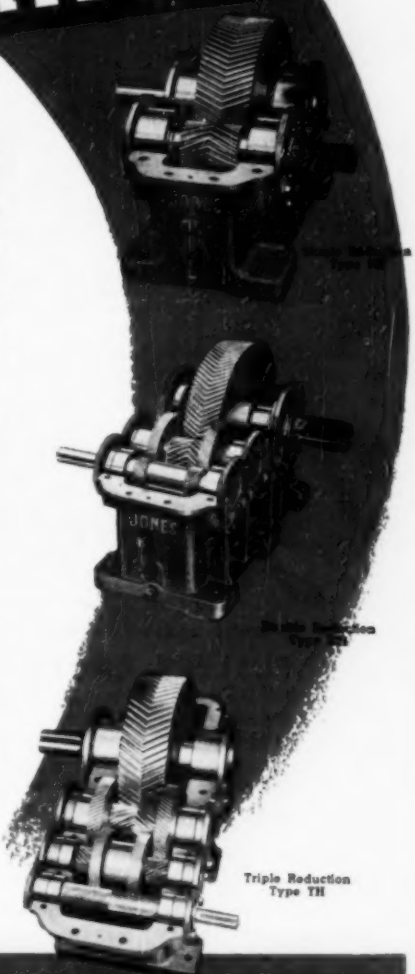


Here's Complete Information About the Application of Herringbone Reducers

This 128-page catalog of Jones Herringbone Reducers presents a vast amount of data relating to Herringbone Reduction Units. Illustrations show a broad range of herringbone reducer applications and the technical information shows how to select reducers for all conditions of service in accordance with the A.G.M.A. recommended practice.

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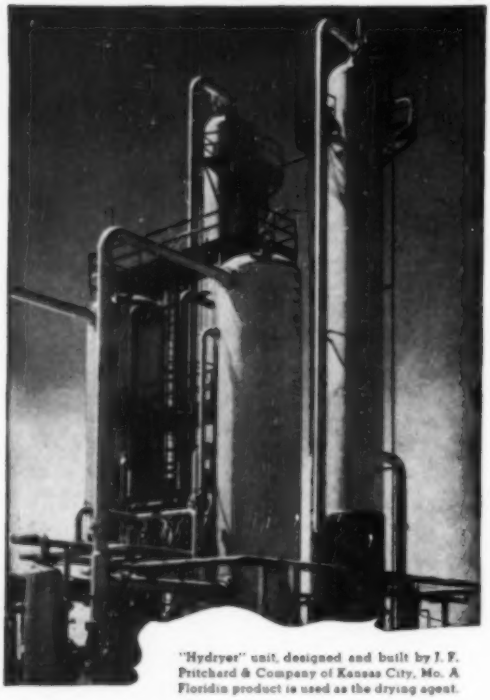
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Triple Reduction
Type TH

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FLORIDIN products, known and approved for more than thirty-five years, have been adapted, by continuous research, for the most advanced modern uses. On any problem of adsorption—dehydration—catalysis—decoloration, you may find an answer in

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they might well make tin solder unsuitable for use near cyclotrons, atomic piles, and other generators of nuclear energy.

Running checks on the amounts of manganese or cobalt in steel and aluminum could also be made by an instrument emitting neutrons with a velocity particularly attuned to absorption by manganese or cobalt.

Difficult chemical analyses involving, for example, the hard-to-separate rare earth elements can be performed simply through observation of neutron absorption. By a different technique, measurement of the scattering of low speed neutrons, it is possible to determine the amounts of hydrogen remaining when hydrogen is replaced by fluorine in the manufacture of fluorocarbon compounds, which promise to be particularly valuable as flameproof construction materials in the future.

T. Ivan Taylor, Columbia University, before New York Section, American Chemical Society, New York, Nov. 20, 1948.

RUBBER

Food for Bacteria

J. T. Blake and D. W. Kitchin

BACTERIA lurking in the soil can wreak havoc on underground cable systems by destroying their rubber insulation. Although ideal conditions for such bacterial depredations are fortunately rare, the problem nevertheless has assumed real importance in view of the widespread modern use of rubber-insulated and jacketed cables without protective lead sheathing.

Popularity of this type of insulation results in part from the current lead shortage, with its attendant high prices, and in part from the lighter weight and greater convenience of the rubber-covered cables and their good service record over a period of years.

The situation necessitates the exercise of special care in the design and formulation of rubber articles which must be buried in the ground. Recent research has demonstrated that rubber compounds can be devised which appear much more germ-resistant than the more common types, and which may in fact prove wholly resistant.

Bacteriologists have known for some time that certain microorganisms can attack and destroy rubber, but up to now there have been no published reports on the effect of bacteria on rubber-insulated cables.

Rubber insulation is more sensitive to bacterial action than other products in that it may be harmed seriously from an electrical point of view even before there is any appearance of physical degradation of the rubber.

Ideal conditions for the action of

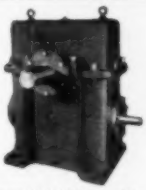
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Single, Double, Triple Reduction



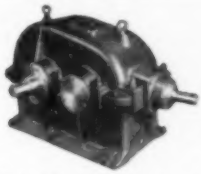
Type "H" Worm Gear



Straight Line Gear Reducer



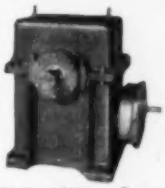
Motorized Reducers



Spiral Bevel Herringbone



Double Worm Gear



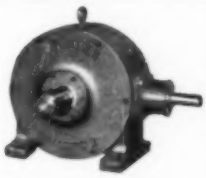
Helical Worm Gear



Motorized Worm Gear



Right Angle Gear Reducer



Spiral Bevel Gear

D.O.James Gear Manufacturing Co. is constantly developing and continuing to improve its variety of gear speed reducers—enabling engineers and designers of power-saving equipment to meet and cope with space limitations, horsepower requirements, ratios, location of driven or driving shafts and the type of drive that the many and varied installations require. Catalogs are available containing complete informative engineering data that will assist in the selection of the type of reducer for the specific job to be done.

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bacteria on rubber exist only rarely in the practical use of rubber-insulated underground cables. Many million feet of such cables have been in service for years without harm from this cause, and they will probably continue to perform well for years to come. The very few failures that have occurred in such cables appear to have been caused by bacterial action under favorable soil conditions.

Soil temperature is a factor of greatest importance since bacteria are most active between the temperatures of 80 and 100 deg. F., a level reached on only a few days of the year in temperate climates. In addition, the soil must be "bacterially active"—that is, it must contain large quantities of bacteria, and they must be of the types which attack rubber.

Subsoils probably are not so harmful as topsoils and a good supply of minerals must be present to nourish the organisms. The soil must be somewhat porous, to provide air, and the moisture content must be just right, as neither flooded soil nor very dry soil is particularly harmful to rubber. The soil also must be slightly alkaline to promote the vigorous growth of bacteria, and most soils are rather acidic.

On the other hand, suitable conditions for maximum bacterial activity can be attained in the laboratory. By this means, the effects of years of service conditions can be imitated in a few months. This provides a highly accelerated means of studying the harmful effects of bacteria on rubber. It has been found that electrical resistivity of rubber insulation is an extremely sensitive criterion of bacterial attack. Even a few weeks' exposure may decrease the resistivity of some rubber compounds a million-fold.

Some of the synthetic rubbers appear to be more resistant to many organisms than does natural rubber although they may be harmed by more active varieties of bacteria.

In any event, it appears possible, by proper compounding, to make rubber insulations which are quite resistant to bacteria.

John T. Blake and Donald W. Kitchin, Simplex Wire and Cable Co., before Rubber Division, American Chemical Society, Detroit, Nov. 9, 1948.

FISCHER-TROPSCH

Hydrogen and Synthesis Gas Production

R. M. Reed and Arne Eriksen

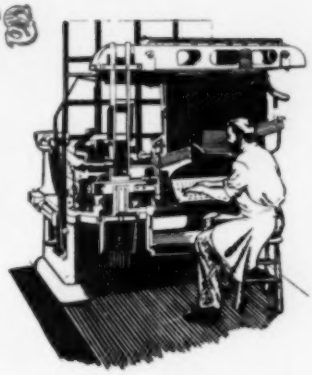
THE hydrocarbon-steam process for the production of hydrogen and various mixtures containing carbon monoxide and hydrogen has become increasingly important in recent years. In the first large-scale development in

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THE LINOTYPE MACHINE

Koven

WAS MAKING INDIVIDUALIZED
CHEMICAL EQUIPMENT





Vacuum vessel made of steel. Anchor type agitator. Hollow shaft with thermometer tube extending to bottom. Diameter 12", overall height 18".



KOVEN's present standing in the field of chemical equipment manufacture goes back over 67 years—to the days when we first began making individualized units to perform specific operations. Then, many chemical plants found that KOVEN-built equipment made for more efficient, economical production. Today, our services continue, implemented by the complete, modern facilities of our two huge plants: welding and flame-cutting apparatus, sheet and plate metal shops, stress-relieving furnaces, pickling tanks for galvanizing. Our exclusive X-ray inspection allows quality control. KOVEN equipment in all commercial metals and alloys includes: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils.

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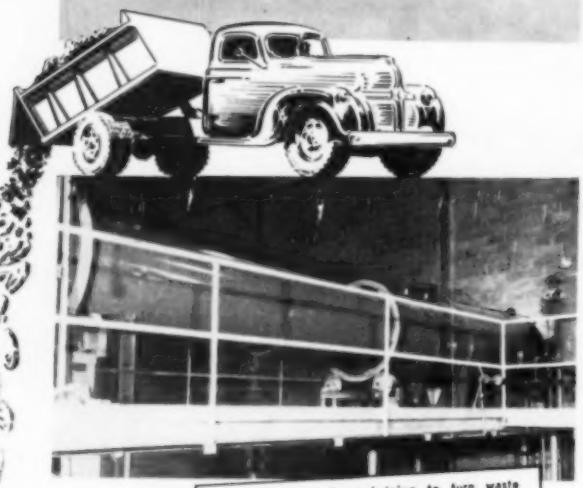




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KOVEN FOR INDIVIDUALIZED CHEMICAL EQUIPMENT SINCE 1881

hersey helps WHEATLAND "turn waste into dollars"



Another Hersey Dryer helping to turn waste into dollars by drying the crystals of zinc sulphate, a by-product recovered from pickling waste. Installation at Maneely Chemical Company, Division of Wheatland Steel Tube Company, Wheatland, Pennsylvania.

Wheatland Tube Company and Wheatland Steel Products Company use vast quantities of pickle liquor in the manufacture of steel tubes and pipe couplings. Like most everyone else, Wheatland for years discarded the spent liquors—*and the valuable by-products they contained.*

But recently, after years of research, Wheatland engineers developed a successful process for utilizing pickling materials by reacting them with zinc by-products from the galvanizing department to produce ferric hydrate and the sulphate and chloride of zinc. Hersey equipment plays an important part in the operation: after the impurities have been removed and the ferric acid filtered out, zinc sulphate is crystallized, washed and then dried in a 5' Concurrent Flow Hersey Dryer specially constructed for the job. Handling 1000 lbs. an hour, this Hersey Dryer removes 94% of the free water from the crystals making them ready for immediate packaging without further processing.

Take a tip from Wheatland and stop dumping valuable waste. Find out how you can profit by turning it into dollars by consulting Hersey — write, wire or 'phone today.

hersey • dryers

Division Hersey Mfg. Co. • Second Street at E • So. Boston, Mass.

this country, natural gas was reacted with steam at about 1,600 deg. F. in a furnace containing vertical chrome-nickel alloy steel tubes. This gas was suitable for hydrogenation of various petroleum materials.

The second large-scale utilization of the process has been in the field of ammonia synthesis. Synthetic ammonia has been produced at very reasonable cost and operations have been highly successful. Sulphur compounds, which are troublesome impurities, are not present in the synthesis gas.

The above adaptations of the process utilize natural gas and refinery gases, both of which are normally gaseous mixtures. Several years ago Girdler Corp. adapted the hydrocarbon-steam process to the production of high-purity hydrogen, using propane and butane as process materials. In addition to their relatively greater availability, these hydrocarbons are advantageous when it is necessary to produce hydrogen entirely free of nitrogen. High-purity hydrogen has found its principal use in the hydrogenation of various animal and vegetable oils in the presence of nickel catalysts. Another important use is in the preparation of anhydrous hydrogen chloride for plastics manufacture and other purposes. A third use is in the synthesis of organic chemicals derived from light petroleum hydrocarbons.

Since the gas mixture resulting from the hydrocarbon-steam reaction consists of carbon monoxide, carbon dioxide and hydrogen, it is possible to produce mixtures suitable for various synthesis operations such as the methanol and Fischer-Tropsch syntheses. Another field of great interest at present is in production of gas mixtures for supplementing utility gas.

R. M. Reed and Arne Eriksen, Girdler Corp., before California Natural Gasoline Association, Los Angeles Sept. 3, 1948.

MATERIALS

Silicone Uses

Philip C. Servais

FIRE hazard has been eliminated from varnish manufacture by an oil which prevents the formation of highly flammable suds. This oil, one of the silicone compounds, is also proving valuable in the processing of plastics, soap, sugar, drugs, and condensed milk. The addition of a minute amount of the chemical permits rapid heating with no danger of foaming and resulting fire.

The antifoam silicone is one of 80 developed since the discovery of silicones five years ago and new uses for

Announcing ... ANOTHER BECKMAN ADVANCEMENT IN SPECTROPHOTOMETRY

THE BECKMAN MODEL "B" SPECTROPHOTOMETER

Accurate—Convenient—Versatile... and Low Priced



Note simplicity of controls. Also note the sloping panel that permits easy readability of scales from both sitting and standing positions.

ADVANCED FEATURES DESIGNED INTO THE MODEL "B" INCLUDE...

CONVENIENCE:
Direct reading wavelength scale ... 320 to 1000 millimicrons ... readings reproducible to great accuracy.

Direct reading transmission and **absorbance** (optical density) scales on large easily-read meter.

Continuously variable slits for smooth, precise settings.

4-Position sensitivity multiplier permits readings to be made on most advantageous portion of scale.

Four position cell carriage permits quick positioning of any of 4 cells by an external control.

ACCURACY:
Photometric accuracy to 0.5% transmission or 1% absorbance.

Negligible stray light—stray light effects completely eliminated between 360 and 1000 millimicrons ... less than 1½% even at 320 millimicrons.

Resolution—permits less than 5 millimicron band width over most of spectral range.

VERSATILITY:
Liquid, solid and gaseous samples may be analyzed.

Monochromatic light beam is easily brought outside the instrument for long path measurements and special uses.

Accommodates large cells up to 50 m. m. path length in standard cell carrier.

Interchangeable photocells—red or blue-sensitive to utilize the high resolving power of the Model "B".

Easily-attached Model "B" accessories will be available for special types of measurements and for added convenience and accuracy. Write for details.

The new Model "B" Spectrophotometer is by far the outstanding routine instrument available. It provides advancements pioneered in the Beckman Quartz and Infrared Spectrophotometers but never before offered in a low priced instrument. These advantages are important because they combine simplicity, convenience and versatility without sacrificing accuracy and reliability.

The Model "B" has better ultraviolet performance ... better resolution ... better wavelength and photometric accuracy ... and more freedom from stray light than any other instrument in its field.

A descriptive bulletin on the Beckman Model "B" Spectrophotometer will gladly be sent on request. Write today. *Beckman Instruments, National Technical Laboratories, South Pasadena 14, California.*

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pH Meters and Electrodes—Spectrophotometers—Radiation Meters—Special Analytical Instruments

New! TERRISS 3-SPEED
PORTABLE MIXER
STIRS • BLENDS
MIXES • AGITATES

No more carrying heavy mixer . . . clamping to tanks . . . breaking side walls

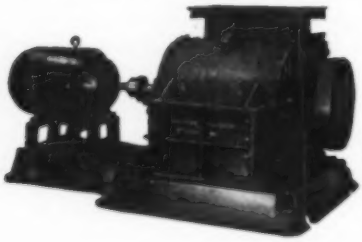
The New TERRISS 3-speed Portable Mixer is an all-around unit that will take care of all your mixing, blending and agitating problems. If your tank or vat is below floor level the TERRISS 3-speed Mixer will reach down and do a real job for you. If your container sits on the floor, a little adjustment and the mixing begins. If your tank or container is high off the floor, TERRISS Mixer will lift up and do the mixing job. All parts that touch your product are Stainless Steel. Standard belt drive permits propeller speeds of 175 RPM, 325 RPM and 575 RPM. Other combinations are available with simple adjustments. Both propeller shaft and stand are adjustable, permitting unlimited settings to fit any job in your plant.



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these versatile chemicals are being found almost daily.

Silicones were first accepted industrially because of their exceptional heat stability. Since that time the silicone fluids, resins, paints, compounds, greases and rubber have continued to show improvements in certain other of their unusual properties. These alterations and additions have been the result of work done on customer problems. In this way silicones have found their way into many new and interesting applications.

Silicones have resulted in more efficient fabrication of industrial products and led to improved resistance to cold, moisture, and chemicals, and better stability of the products.

Recent tests of silicone paint to prevent smokestack corrosion have been highly successful. Although the cost of using the paint was 30 percent more than that of conventional paint, the silicone product has lasted more than twice as long and it appears that it will be good for four times the duration of conventional paints.

Many grades of silicone rubber have been developed which are characterized by resistance to both flames and very low temperatures. One of the newer types not only is heat-resistant but, if it does catch fire, will not continue to burn when the kindling flame has been removed. This makes it suitable for use as insulation on ignition and instrument wires in places where the spreading of a fire cannot be tolerated. Sheets of this new material have shown their utility when applied to aircraft where flame control is essential.

Philip C. Servais, Dow Corning Corp., before Northeastern Section, American Chemical Society, Fort Wayne, Nov. 16, 1948.

MANAGEMENT

An Index of Return On Research

Fred Olsen

An "Index of Return" is now being used by the Western Cartridge Co. Original work on the index was begun in an effort to put a monetary evaluation on research projects conducted in Western's laboratories.

The index determines the returns on research projects in such a manner that a board of directors can tell what the company is actually earning from completed projects and can estimate what it may reasonably expect to earn as a result of its research expenditures.

By knowing the past value of research projects, a board of directors can more readily approve the all-important research budget. In showing the ex-



Instant Relief *from* UNSCHEDULED Over-pressure



Top flange of SAFETY HEAD known as "Hold-down" flange.



SAFETY HEAD rupture diaphragm.



Base flange. SAFETY HEAD flanges available in many sizes and types —can be made to order!

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Black, Sivalls & Bryson's SAFETY HEAD is a simple device including a rupture disc which bursts at a predetermined pressure and thus affords instant relief from unscheduled over-pressure, no matter what the cause. (See "exploded" view at left.)

Four types are approved by Pressure Vessel Codes: 1. As the sole relief device for complete pressure protection. 2. To supplement a relief valve in case a valve sticks or in case of explosion. 3. Under a relief valve to prevent leakage and to isolate the valve from sticky or corrosive materials. 4. On a relief valve outlet to prevent leakage on pressure systems containing non-corroding gas or liquid.

For further information, write Special Products Division, Black, Sivalls & Bryson, Inc., Power and Light Building, Kansas City 6, Missouri.

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We have been weaving filter cloth for more than forty years and have pioneered in the weaving of synthetic fibers into industrial filter media. These years of weaving industrial filter fabrics have furnished us the background and the "know how" necessary to produce synthetic filter media having *superior* filtering characteristics.

When requesting literature and pilot test samples, tell us about your problem.

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tent of financial returns from research to a company, the index is also beneficial to management as well as to research and factory departments.

It is not enough for a research director to say, "Our company was built upon the results of research and thus, our management knows that research pays." There is an obligation on the part of the research director to prove in clean, crisp terms that the results obtained from large sums spent on research and development comprises an adequate dollar return.

The method is still in the experimental stage. The index is a number derived by totaling, in arbitrary units, recorded savings on process improvements, sales of new and improved products, and estimated returns from processes accepted for plant use but not yet in production.

The dollar equivalent of the index is not a credit applied against research expense or shared in by research. Because other production and sales units share in the credit of the index, it is only a yardstick for the director of research to use in measuring the effectiveness of his organization.

Fred Olsen, Olin Industries, before Philadelphia Section, American Chemical Society, October 1948.

BIOCHEMICAL

Making Microbes Work for Us

Carl S. Miner

SCIENCE is drafting microbes to help avert starvation of the human race. They can make a major contribution to the world's food supply by converting wood waste and other inedible materials into animal feed and thus freeing vast quantities of grain for human consumption.

Investigation of the anti-starvation role of microorganisms is relatively only in its infancy, but their potential service to humanity is the most exciting phase of this whole subject.

Scientists have shown that ammonia salts or urea can be fed to cows and other ruminants in amounts equivalent to about one-third of their normal protein rations, and that bacteria in the animals' digestive systems can transform such nitrogen compounds into protein which the animals can use to build body tissue.

This use of ammonia and its derivatives as protein substitutes for farm animals is no longer a laboratory experiment.

When we realize that one of the serious world shortages is of protein, that here is a potential substitute for one-third of the protein now fed to ruminants, and that in the last analy-

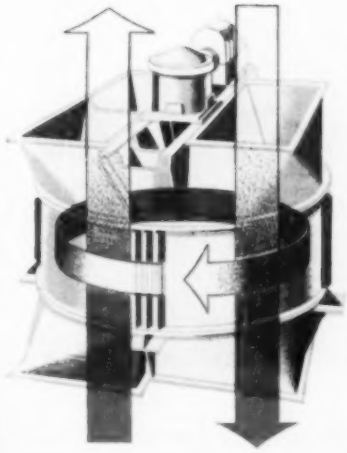
Fact File on Preheat

IN THE LJUNGSTROM, heat is not required to pass *through* the metal and its surface accumulations.

This type of air preheater maintains heat recovery at a *constant level* despite the inevitable surface accumulation of soot and fly ash.

Between cleanings, the surface "as is," acts as an efficient heat storage and transfer medium.

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The Ljungstrom Air Preheater is a compact gas-to-air or gas-to-gas heat exchanger, operating on a continuous regenerative counterflow basis. Hundreds of power plants and other special applications confirm its high level of heat recovery and long-term service at low maintenance expense. Write for engineering details to:

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No Stuffing Box
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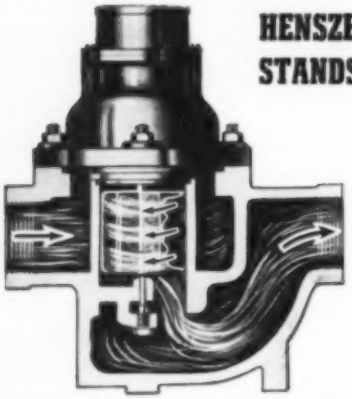
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for Corrosive · Abrasive · Thick Heavy or Viscous Fluids

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Double acting reciprocating type.
Suction lift to 18 ft.
Delivery pressures to 100 p.s.i.
Capacity—1 to 100 g.p.m.
Drive: geared head motor, V-belt, variable speed, or simple pulley.

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sis it can be made from the constituents of air and water, the tremendous potentialities become apparent.

There is no reason to suppose that, for example, by selection of strains of microorganisms to be ingested along with the non-protein nitrogen compounds, it may not be possible to make feasible the use of a still larger quantity of the animal's protein requirements in this form or even to make it possible to utilize these protein substitutes in the diet of domestic animals other than ruminants.

Microbes also can manufacture vitamins from relatively low-grade organic material. The familiar production of vitamin-containing yeast by microorganisms can be carried on without the use of human food materials. It may become an important source of these vitamins, as well as of protein, for animals.

Recovery of twenty tons a day of a feed supplement containing riboflavin, or vitamin B-2, from the residue of a plant producing fermentation butanol is another example of the service bacteria can perform.

The paper industry at present is financing a full-scale plant to determine the feasibility of utilizing the waste liquors from their factories in making yeast for food or feed.

An unusual new development in the use of microorganisms which has been reported recently, is the discovery that a substance produced along with the antibiotic drug streptomycin can protect growing plants from powdery mildew, thus opening up the possibility of employing microbes to make fungicides.

Carl S. Miner, Miner Laboratories, before American Section, Society of Chemical Industry, New York, Jan. 7, 1949.

PETROLEUM

Oil Refining and Organic Chemicals

Bruce K. Brown

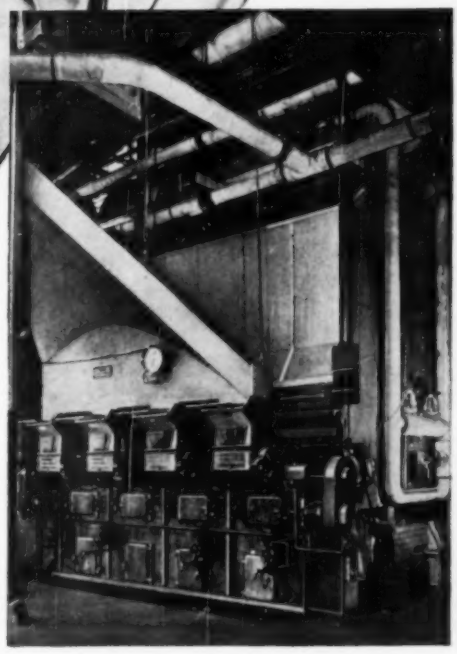
Oil and gas should be available to the synthetic organic chemical industry in amounts much larger than the industry is apt to need. Regardless of the rising economic importance of the synthetic organic chemical industry and the good profit possibilities in it, it seems unlikely that supplying the chemical industry with petroleum raw materials will have any profound effect on the petroleum industry as a whole. Consumption of oil and gas in chemical manufacturing could not use so much material that it would cause a fuel shortage.

Ethylene is perhaps the most important single raw material in the synthetic organic chemical industry. From



Makers of *Community*

"stir up" new economies with boiler modernization



The Sherrill, N. Y. plant of Oneida Ltd., manufacturers of Community, Heirloom Sterling, 1881 (R) Rogers (R), and Tudor Plate silverware is another typical example of how boiler modernization pays off. Here, one new B&W Integral-Furnace Boiler replaced two old boilers with these results: steam capacity more than doubled—less floor space occupied—efficiency up—reliability increased—wider variety of coal burned.

Perhaps you can profit by calling on B&W to help you "stir-up" new economies through modernization of your steam-generating facilities.

• Selection of this 90,000 lb. per hr. stoker-fired B&W Boiler to replace two old units was strongly influenced by 10 years' satisfactory service of another B&W Integral-Furnace unit in the same plant.

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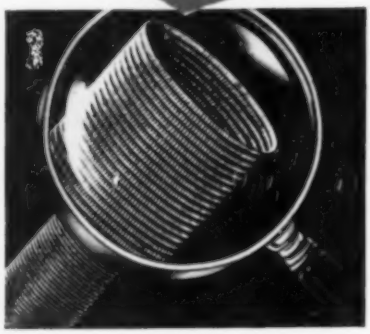
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- **A good strainer protects your equipment and pipelines. The most important part of a strainer is the screen.**
- ***Screens* used in Yarway Strainers are made of high-grade monel woven wire having small triangular openings fine enough for required stoppage of dirt, rust and scale, but having ample free area for passage of clean condensate, oil or other fluids. Mechanical strength is greater than ordinary mesh. Perforated screens if desired.**
- ***Screen cap* is made with straight thread, machined face and spark-plug-type gasket, insuring tight joint. Screen comes out with cap for easy cleaning... automatically aligns when replaced.**
- **Iron and steel bodies of Yarway Strainers are cadmium-plated for protection against corrosion and better appearance.**
- **Six sizes, ½" to 2". Hundreds of thousands in use. Stocked and sold by 150 Mill Supply Dealers. See your local supply house or write for Bulletin S-201.**

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YARWAY STRAINERS
"Police the Pipelines"

it is made synthetic ethanol, polythene, the new plastic whose production is growing rapidly, ethylene glycol, etc. Ethylene is also an important raw material in synthetic rubber.

Currently the greatest interest is the synthesis of liquid fuels—not chemicals. The output of several Fischer-Tropsch plants (engineered or building) would not be important from the gasoline standpoint, but the byproduct chemicals will loom large indeed in the national chemical scheme.

Bruce K. Brown, Pan American Petroleum Corp., before Southwest Regional Meeting, American Chemical Society, Shreveport, Dec. 9-11, 1948.

SOCIOLOGY

Science for Survival

Watson Davis

THE FEAR that is abroad in the world, the insecurity of the future of the peace, the suspicion of motives and future actions, these factors are in many respects more important than the massing of super-arms and the prospect of man-made epidemics. For the human feelings and emotions that make the world insecure and explosive are with us continuously in our divided world, doing their insidious damage now.

Science is often blamed for causing war. The answer is: Man, not knowledge, causes war. In the belief of those who have been working on tha problem, war can be avoided and peace maintained by using the methods and knowledge of science. "War is not born in men; it is built into men." Two thousand American psychologists in 1945 agreed that "no race, nation or social group is inevitably warlike."

Freedom and honesty are basic to science and at the very heart of the democracy of free peoples. Science naturally develops on a world-wide front and provides all nations with natural channels to and from their neighbors. The encouragement of the growth of science and technology throughout the world as the most powerful existing force working toward world peace.

Modern wars between nations and groups of nations are fostered by many of the myths, traditions and symbols of national pride handed down from one generation to another. Many social symbols are still nationalistic and these hinder the free movement of thought across political boundaries of our interdependent world.

Granted we know the remedy for world war, as the experts suggest. How can we apply the remedy? How can we get the patient to take medi-

BETHLEHEM THERMOCOIL

PUTS IN EFFICIENCY...TAKES OUT LAGS

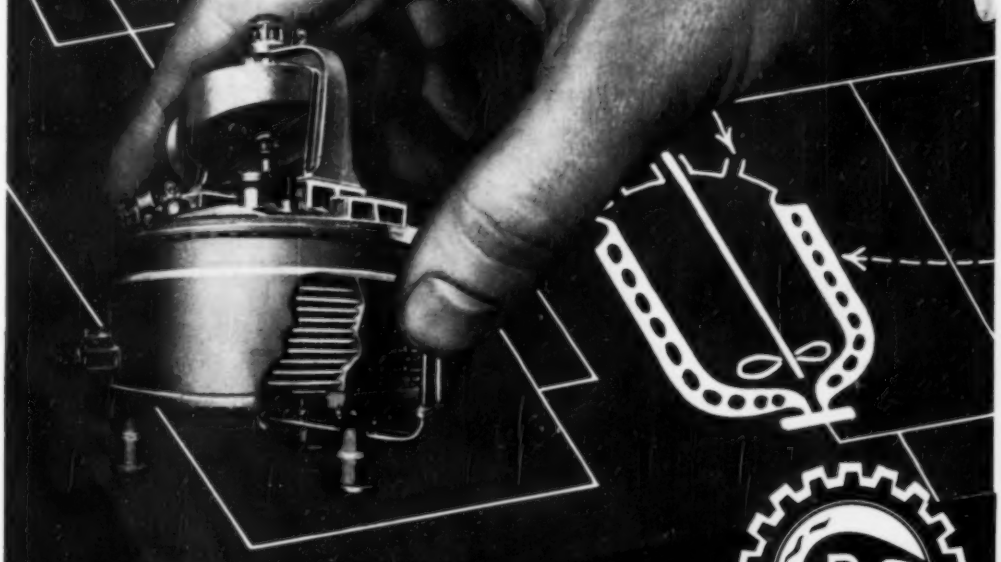
Heats or Cools Fast...Uniformly...Efficiently

If your process has a heating or cooling stage, here is a vessel that transfers heat at a rate now stepping up output in scores of plants.

It's the Bethlehem Thermocoil. By means of a series of coils cast integral with its walls, Thermocoil becomes a homogenous heating mass that imparts an even temperature over its entire inner surface. Continuous circulation of transfer medium within the coils (up to pressures of 3000 psi) enables you to eliminate hot spots, increase transfer rate, avoid building up of charge when cooling.

Thermocoil equipment is available in a number of shapes fabricated to your exact specifications. Sizes range from 18 inches to 9 feet in diameter . . . depths as required for capacity.

Join the many plants now getting more uniform products—faster—in drying, distilling, evaporating, etc., by contacting a Bethlehem engineer today.

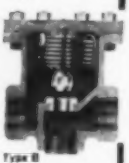


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Does Dirt Plug YOUR Steam Traps?

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Type B



Type AU

This ability to self-clean is one of the features resulting in the unequalled discharge capacity of Nicholson traps. 5 types for every purpose; size ¼" to 2"; press. to 225 lbs. BULLETIN 1047



Type AWv

W. H. NICHOLSON & CO.

706 Oregon St., Wilkes-Barre, Pa

cine? More accurately, how can we get the troublesome part of the world to get acquainted with its hidden self sufficiently to feel adequate and secure? How can we get the Russian Red Bear to lie down on the psychoanalytic couch and get some insight into the facts of peace? That is the 200 billion dollar question (a minimum cost of another war, so far as war can be evaluated in dollar signs of our national debt). The stakes are so high that almost anything we can do that might prevent war is justified.

In the conduct of international relations, both by the international agencies and by our own nation, more use might be made of the specialized experts in human behavior, group action, and feelings and emotions.

Why should not there be a team of psychiatrist, psychologist, anthropologist, and public opinion expert attached to the U. S. delegation to diplomatic conferences in which our diplomats deal with other national representatives of backgrounds and temperaments quite different from their own.

As in interpersonal relationships, there is much room for professional judgment in international relationships. Such "psycho-teams," as suggested, might solve some of the problems confronting international arrangements and negotiations. They would not do harm and they might give successful aid.

Watson Davis, Science Service, before International Symposium on Feelings and Emotions, Chicago, Oct. 29, 1948.

FOREIGN LITERATURE ABSTRACTS

Effectiveness of Boiler Compounds

USUAL methods used to determine the effectiveness of compounds for scale prevention in boilers have one basic disadvantage—scale formation is studied on surfaces which are not elements of the heating surface. All the different phenomena which lead to the formation and prevention of scale are not exhausted by experiments conducted in glass flasks and metal vessels, or in laboratory autoclaves. For practical operation of boilers it is very important to know how the process of scale formation depends on the heat liberation volume of the surface sections. The existing construction of autoclaves does not make it possible to determine this dependence quantitatively since the unheated portions

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Advantages over conventional filter mediums:

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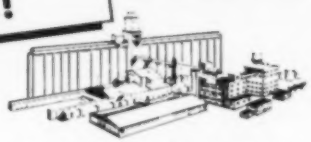
Wilkes-Barre, Pa.

*Trade Mark Reg. U. S. Patent Off.

THE PRATER *DUAL-SCREEN* PULVERIZER



Standard Equipment at Central Soya!

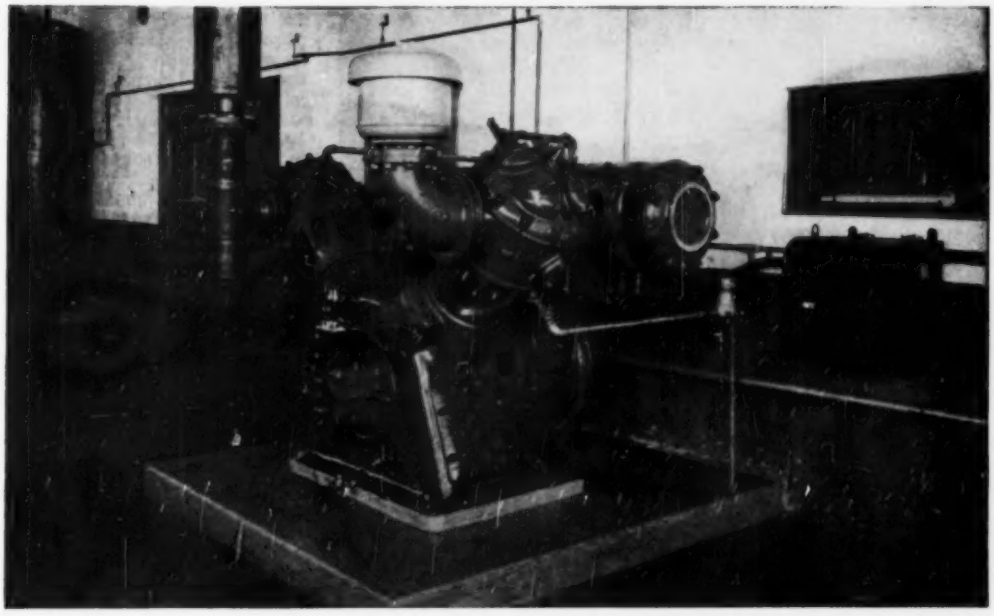


A leader in the development of the solvent process of extraction, Central Soya Co., has contributed much to the improvement of equipment used in the process. The design of the Prater Dual-Screen Pulverizer, for example, is based to a considerable extent upon the recommendations of people who *know* the solvent process.

As a result, the Prater Dual-Screen Pulverizer is standard equipment at Central Soya's Solvent Extraction Plants at Gibson City, Illinois; Decatur, Indiana; and Marion, Ohio.

If you are working with this process, it will pay to standardize on the equipment that's built to do the job most efficiently and economically. Write: Prater Pulverizer Co., 1517 South 55th Court, Chicago 50, Illinois.

PRATER PULVERIZERS



Here's top efficiency in the 400 to 1800 c. f. m. range!

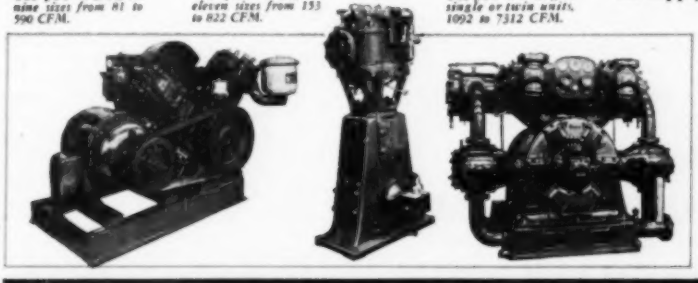
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Built in sizes from 378 to 1828 CFM, the JOY WN-112 is a two-cylinder, two-stage, heavy-duty compressor with the exclusive JOY "Dual-Cushion" valves for top efficiency. Compact and highly modern, it saves space and cuts installation costs. ● JOY builds the most modern compressors available for either centralized or de-centralized air supply—*write for Bulletin.*

The JOY WL 80, in nine sizes from 81 to 590 CFM.

The JOY WG 9, in eleven sizes from 153 to 822 CFM.

The JOY WN 114, in single or twin units, 1092 to 7312 CFM.



Consult a Joy Engineer

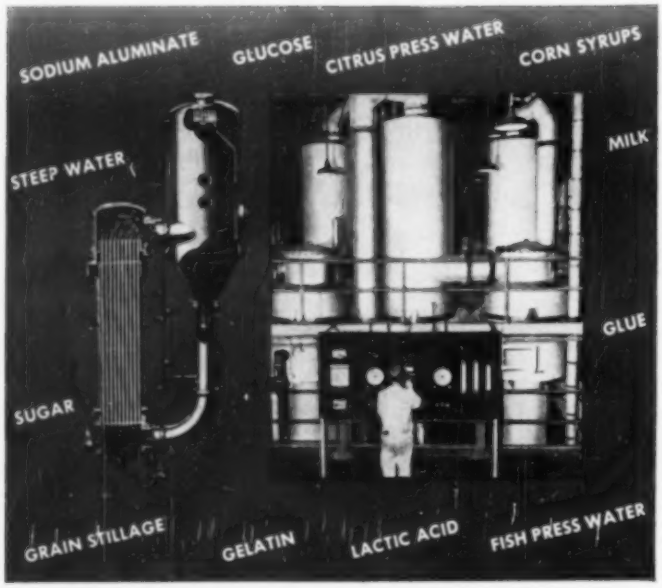


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are not separated from the heated ones, and the weight of the autoclave parts makes it impossible to weigh them on an analytical balance to calculate the scale formed. An apparatus was therefore designed which would not have these disadvantages. It consisted of a stainless steel vessel with a base (the heating surface) which could be easily detached from the unheated cylindrical walls, so that scale formation could be determined directly on the heating surface. The following method was developed to determine the effectiveness of boiler compounds in this apparatus: The inside surface was first cleaned thoroughly to eliminate all grease and similar spots. The base and walls were then weighed separately on the balance, the vessel assembled, filled with 200-250 ml. of water and placed on an electric plate. Water was fed continuously from a separatory funnel to keep the level constant. After evaporation of a given quantity of water, the residual water was poured out of the vessel into a measuring vessel for chemical analysis and determination of the weighed substances. The vessel itself was dried, taken apart, and the base and cylinder again weighed—the difference in weight before and after the experiment giving the quantity of scale formed. Effectiveness of the boiler compound was determined by adding it to the water and repeating the experiment. It was also found that deposition of scale decreases with increase in heat liberation volume of the heating surface.

Digest from "Method of Determining Effectiveness of Boiler Compounds," by S. I. Sevastyanov, *Zavodskaya Laboratoria* XIV, No. 8, 954-957, 1948. (Published in Russia.)

New Products From Urea

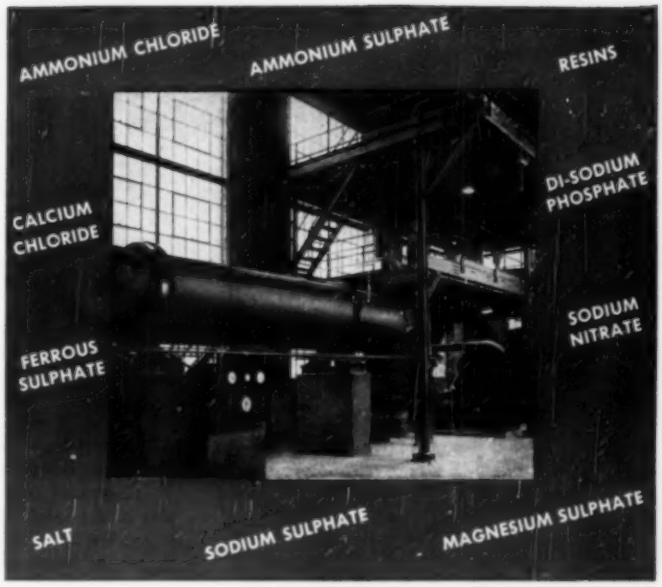
New types of 2,4,6-triazines have been prepared by reaction of urea with aldehyde ammonias as well as with aldehydes and ammonia or amine bases. No triazine is formed with formaldehyde since the latter usually produces hexamethylene tetramine with ammonia. Thiourea or guanidine, as well as mono- and symmetrical disubstitution products, can be used instead of urea. Amine bases, which contain still another functional group in the organic radical, especially –OH or $-NH_2$, can be used to prepare triazines which can undergo still further substitutions. Symmetrical bis-triazines are obtained by condensation of two molecules. Primary bis-triazines can be prepared from diamines. Brown amorphous aldehyde ammonias, when heated with ureas at 90-110 deg., yield brittle, slightly water-soluble resins which, among other things, can find application as foam, textile and dyeing aids. The crystalline aldehyde am-

monias react with ureas differently according to the temperature used. Crystalline acetaldehyde ammonia, for example, can be made to react with urea to yield a new crystalline substance which begins to condense to a triazine at temperatures of more than 40 deg. In this case it is 1-keto-3,5-dimethylhydro-2,4,6-triazine, a compound which is of interest for different technical purposes in the textile and dyeing aid field. Compounds of the triazine type are obtained in an analogous manner from amine bases, the most important condition being the use of temperatures of less than 30 deg. Such triazines are weakly basic and form double salts with acid salts and many inorganic salts. Compounds of this type are water-soluble or hydrophilic and therefore combine especially readily with synthetic materials capable of swelling from water, and particularly with the galalith-type of albuminous substances. The many other different kinds of triazines which can be prepared have properties that make them suitable for a variety of industrial purposes.

Digest from "New Types of Reaction Products of Urea with Aldehydes and Ammonias or Amine Bases" by A. M. Paquin, *Angewandte Chemie* A 60, No. 10, p. 267-271, 1948. (Published in Germany.)

Behavior of Non-Oxidizable Steels in Acids

THE ELECTROMETRIC method is particularly suitable for the study of a phenomenon with such an electric nature as corrosion, and was therefore used to determine the behavior of a non-oxidizable chrome-manganese steel in the presence of a solution of 5 percent oxalic acid. The potential-time curves, plotted for immersion times of up to 1,000 hr., showed that the chief factor of dispersion was the degree of aeration of the solutions at a certain critical phase of the immersion and, more specifically, access to atmospheric air. The potential curves are arranged diagrammatically in a succession of several potential levels with fairly rapid transition from one to the other. The following are observed for active test pieces (sanded): (1) A first, electronegative level with visible corrosion; (2) A second level, still electronegative but some hundred millivolts higher than the first; transition level of an unstable nature corresponding to a very retarded corrosion and during which the dissolved oxygen is active; (3) A third electropositive and stable level. The test pieces remain some 10 min. at the first level, several hours at the second and then, depending on whether there is any access to air or not, they go up to the third level or return to the first. Definitive passiva-



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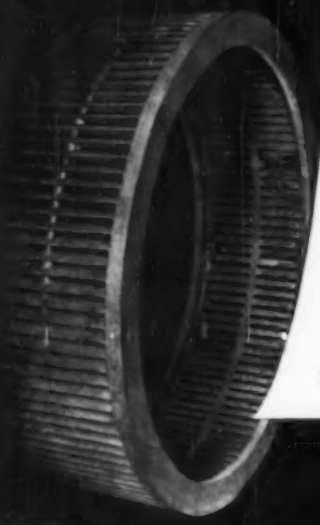
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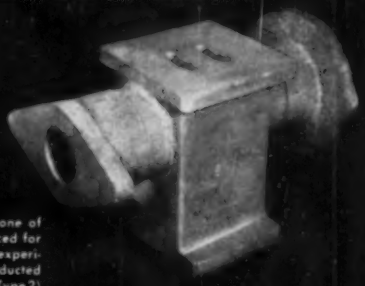
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Chemalloy screw casting used in pineapple processing plant to resist corrosive action of fruit juices. (19-9-Mo Stainless)

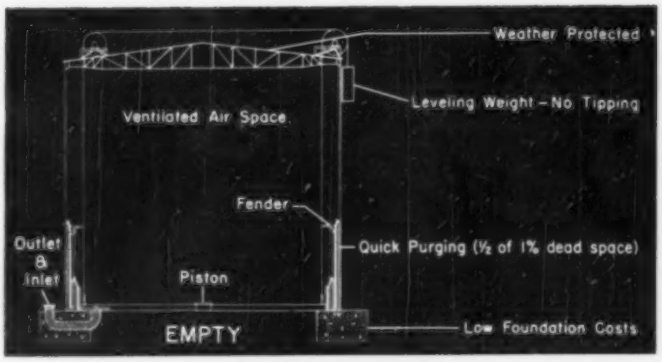
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ELECTRO-ALLOYS DIVISION

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tion takes place in the first case, definitive corrosion in the second. Final passivation always takes place with suppression of the transition level when the solution is agitated. The essential fact is that passivation can occur in the acid medium itself. This acquired passivity requires the presence of oxygen and a certain delay for its formation. Above all, it appears to be connected with a certain amount of corrosion. A remarkable phenomenon is that of sensitization of the active test pieces by preliminary acid attack. Sanded test pieces which have been lightly attacked by hydrochloric acid become passive very rapidly with disappearance of the electronegative transition level when immersed in oxalic acid. Even the first level can disappear almost entirely under certain experimental conditions. The sensitization differs essentially from passivation because the initial potential has the same electronegative value as an ordinary sanded test piece, with the same rate of initial solution. Passivation in an acid medium therefore appears to be always connected with some corrosion, even in the case of preliminary sensitization without oxalic corrosion, since the sensitization has been achieved at the expense of corrosion. As a result, passivity cannot be obtained without corrosion in an oxalic medium except by preliminary passivation, a passivation which can be obtained by humid air or by nitric acid. The mechanism of sensitization is not known. It is not very probable that it is connected with the elimination of a cold-hardened or amorphous superficial thin film by corrosion, since such surfaces can take very great passivities by humid air or nitric acid. It is not always easy to distinguish an acquired passivity from a passivity of origin since the metal shows itself to be passive after immersion. The two passivities do not appear to have the same nature otherwise, and in many cases there is a transition of the one to the other in the acid. This transition is marked by a more or less deep depression of the potential curves. The instantaneous potential always makes it possible to determine the actual rate of solution of the test piece. It does not help to predict the further behavior of the metal. Only an electropositive potential acquired in the acid makes it possible to affirm that the test piece will never be affected by the acid. Measurement of potential is interesting chiefly because it makes it possible to observe behavior of test pieces during their immersion and to interpret the phenomena satisfactorily.

Digest from "Electrometric Study of the Behavior of Non-Oxidizable Steels in Acids" by M. L. Guitton, Memoire, 1948, Extrait de la *Revue de Metallurgie* XLIV, Nos. 11 and 12, 1947. (Published in France.)



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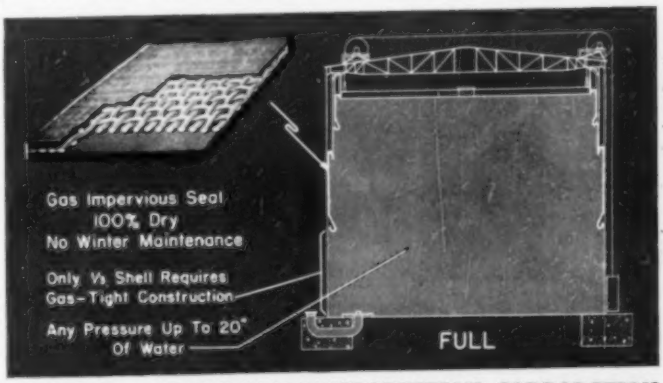
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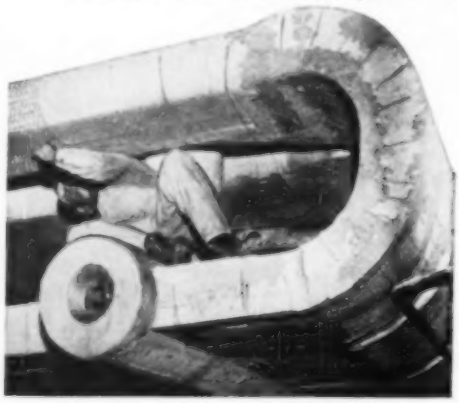
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Lester B. Pope, ASSISTANT EDITOR

Oriental History

THE CHEMICAL ARTS OF OLD CHINA. *By Li Ch'iao-p'ing. Chemical Education Publications, Easton, Pa. 215 pages. $5.*

Reviewed by Morgan C. Sze

EXCEPT for a chapter on Chinese alchemy, Professor Li's book deals mainly with old Chinese industrial chemical processes. The processes described include the following: the smelting and recovery of common metals, the production of salt, sugar, and soybean products, the manufacture of paper, gunpowder, colors, natural dyes, incense, porcelain and lacquered wares, the tanning of leather, and the fermentation of grains to alcoholic beverages and vinegar. A great deal of the information presented is drawn from references which were written in Chinese and have never been translated. Many of the references were written centuries ago. Thus the book should be of great interest to students of this history of chemistry and students of Chinese culture.

To present day chemical engineers, the equipment used by the early Chinese were crude and inefficient. Essentially all processing was practiced batchwise. The scale of manufacturing was small as the power for operation had to be derived from men or trained animals. Nevertheless, with patience, skill, and experience, a great deal could be accomplished even with the crude equipment. Some of the achievements were indeed amazing. For example, with simple tools powered by oxen, brine wells as deep as 2,500 ft. had been drilled. A second example would be the simple kilns used in the ceramics industries. No instruments were available, but with adequate experience and skill, proper temperature control was obtained to enable the production of some of the finest porcelain wares of the world.

In general, the book is interesting. It does not cover any subject in too great detail. To people interested in the history of chemistry and Oriental culture, the book may seem to be brief. As Professor Tenney L. Davis has stated in the foreword, "Its principal defect is in not being long enough."

RECENT BOOKS RECEIVED

Aquametry. By J. Mitchell, Jr., & D. M. Smith. Interscience. $8.

Catalytic, Photochemical & Electrolytic Reactions. By A. Weissberger. Interscience. $5.

The Chemistry and Technology of Enzymes. By H. Tauber. Wiley. $7.50.

Engineering Metals and Their Alloys. By C. H. Samans. Macmillan. $7.50.

Engineering With Rubber. By W. E. Burton. McGraw-Hill. $6.50.

High-Polymer Physics. By H. A. Robinson. Remsen.

Industrial Hygiene and Toxicology, Vol. I. By F. A. Patty. Interscience. $10.

Organic Syntheses, Vol. 28. By H. R. Snyder. Wiley. $2.50.

Paint & Varnish Technology. By W. von Fischer. Reinhold. $8.

Physical Aspects of Colour. By P. J. Bouma. Elsevier. $5.50.

Practical Analysis. By F. A. Willers. Dover. $6.

Hoods, Ducts & Fans

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS FOR DUST AND FUME REMOVAL. SECOND EDITION. *By John L. Alden. The Industrial Press, New York. 252 pages. $3.50.*

Reviewed by M. W. First

SINCE its appearance in 1939 this excellent book has been a very useful source of simple, concise and authoritative information on the design of industrial exhaust systems. The principal additions in this new edition are a chapter on axial flow fans and a much broader treatment of exhaust hoods, including numerous additional examples of hood designs from a diversified list of industries. While the book is addressed primarily to the executive or engineer whose duties are only occasionally and incidentally concerned with exhaust ventilation, the professional ventilation engineer will find this small volume a handy reference for its numerous tables, nomograms and charts as well as for its many practical and knowledgeable bits of information drawn from the author's own experiences in this field. It is unfortunate that the typography is not up to the standard of the rest of the book. The most serious deficiency is that in many instances subscripts and exponents are blurred to the point of illegibility.

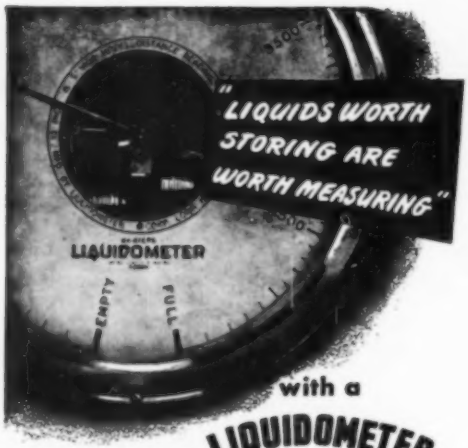
After an introductory chapter on fluid flow, the theory of suction hoods is developed and illustrated by examples of installations used for the control of dust and fumes in a wide variety of industrial processes including those of woodworking, grinding, buffing, electroplating, spray painting, solvent degreasing and foundry shakeout. Step by step procedures for designing hoods and piping and for calculating system pressure drop by the velocity head method are clearly and concisely presented. A chapter on dust separators contains an excellent discussion of cyclone dust collectors. However, less than two pages are devoted to air cleaning by filtration; a method of much wider application, interest and importance than this brief treatment would indicate. Some mention of electrostatic precipitation for the collection of very fine particulate matter would, perhaps, be helpful to those toward whom this book is directed. Centrifugal and vane-axial flow fans are described and their characteristics compared. The final chapter deals with measurement of static pressure and velocity in the field. Although more refined instruments are discussed, the point is well made that a pocket "U" tube manometer and a simple impact tube will yield all the information needed by a skillful engineer to check the performance of a dust collecting system.

Ready-to-Use

ORGANIC SYNTHESES, VOL. 28. *By H. R. Snyder. John Wiley & Sons, New York. 121 pages. $2.50.*

UTILITY and general interest govern the choice of entries for this series of organic syntheses. The editors have shown preference for preparations for which optimum conditions have been worked out. Since preparations are published as they are submitted, chemicals grouped in a volume have no significant relationship. Vol. 28 covers the preparation of 37 compounds ranging alphabetically from 2-acetothienone to vinyl chloracetate.

Each entry has been divided into three sections: procedure, notes, and methods of preparation. The procedure is a step-by-step account of the



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synthesis; equipment is fully described. Range of yields and, generally, the melting point, boiling range at various pressures and the refractive index are given. The notes contain the source of compounds used, criteria of purity and comments on other conditions which may affect the synthesis. The methods of preparation section mentions alternative syntheses which have been published previously and refers to the literature. This format presents the information in a complete, ready-to-use condition.—*FA*

Isotopes

RADIOACTIVE INDICATORS, THEIR APPLICATION IN BIOCHEMISTRY, ANIMAL PHYSIOLOGY, AND PATHOLOGY. *By George Hevesy. Interscience Publishers, Inc., New York. 556 pages. $10.*

Reviewed by W. F. Libby

THE CONTRIBUTIONS of Professor Hevesy to the tracer field have of course been of paramount importance, so the present book has the ring of real authority throughout its length. The initial chapters are devoted to those general principles of radiochemistry concerned with the use of radioactive indicators and the remainder of the book is devoted to biological applications.

It appears that the workers in biological fields will find this book indispensible if they are working with tracers, and highly valuable if they are not. The radiochemist, on the other hand, may not want to read the entire book, but certainly will find the first hundred pages of real value.

Patents

ALKYLATION OF ALKANES. Vol. I, *Patents on Alkylation of Alkanes. By Gustav Egloff and George Hulla. Reinhold Publishing Corp., New York. 1,152 pages. $20.*

Reviewed by J. F. Cosgrave

AS ONE of the American Chemical Society monograph series, all 1,152 pages of this smaller-than-usual type would probably be as interesting and useful to the ordinary layman as a Greek dictionary. But for the specialist in its field, Vol. I represents a repository of valuable information on alkylation of alkanes gleaned from all patents, United States and foreign.

Discovered in 1932 by Ipatieff (to whom the book is dedicated) and Pines, the alkylation of alkanes has become one of the most important organic reactions known. Proof of this may be seen in a wartime application which produced millions of gallons of high octane gasoline. Over 800 patents have been issued to cover

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SULFUR DICHLORIDE SCl_2

Molecular Weight 103
Description ..... Brownish red liquid
Freezing Point ..... −78°C
Boiling Point ..... Decomposes above 40°C
Specific Gravity at 15.5°C 1.638
Analysis ..... Minimum chlorine by wt. 66%

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SULFUR MONOCHLORIDE S_2Cl_2

Molecular Weight 135
Description ..... Yellow to slightly reddish liquid
Freezing Point ..... −80°C
Boiling Point ..... 138°C
Specific Gravity at 15.5°C 1.690
Analysis ..... Minimum chlorine by wt. 50%

USES

Sulfur Monochloride is used in the manufacture of organic chemicals, rubber substitutes; an agent for cold vulcanization of rubber products; a polymerization catalyst; reagent in manufacture of insecticides, chemical intermediates, phenolic resins, and other diversified chemicals; solvent for sulfur.

From the Salt of the Earth

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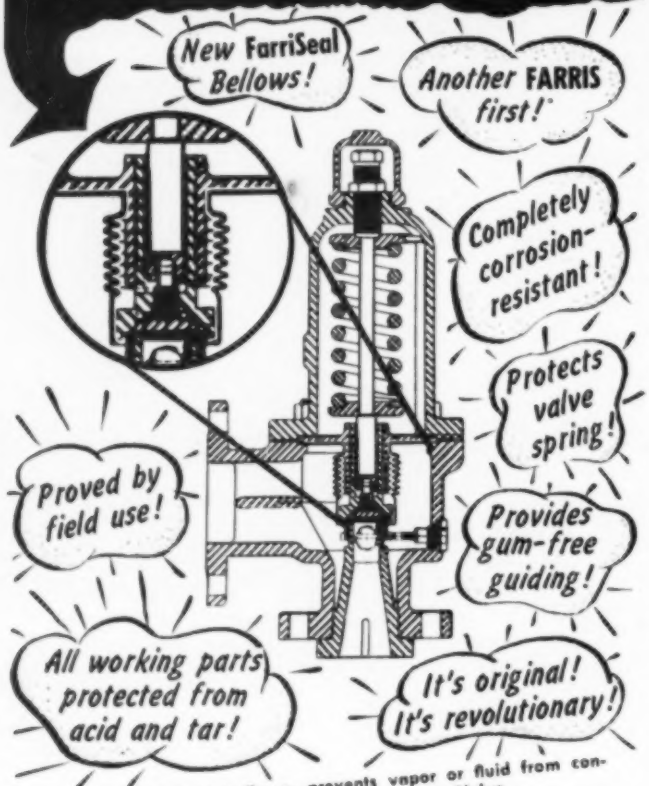
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800 patents have been issued to cover various processes. Since these patents contain much fundamental chemistry and technology, the authors felt that this information should be published in a separate volume preceeding two others covering the scientific and technical literature and other reports. Patents are classified and studied according to processes. The five basic processes considered are catalytic alkylation, thermal alkylation, combination processes, miscellaneous processes and demethylation of alkanes.

In giving credit where credit is due, it should be pointed out that the authors, whose work might appear to be that of merely abstracting the patents, have attempted to make the study complete, and therefore quote certain patents to a greater extent than others.

For Analysts

ORGANIC REAGENTS USED IN GRAVIMETRIC AND VOLUMETRIC ANALYSIS. *By John F. Flagg. Interscience Publishers, New York. 300 pages. $6.*

Reviewed by M. E. Auerbach

THE TITLE of this book defines precisely the area to which the author has limited himself. Organic reagents used primarily for color tests or for the preparation of derivatives are not discussed. Conforming to reasonable precedent, the work is divided into two sections, one having to do with theoretical and general discussions (91 pages), the other with practical applications (190 pages).

The theoretical section discusses, with commendable clarity, the classification of organic precipitants, their reactive groups, the properties and structure of their metallic derivatives, and an exposition of phenomena related to solubility. The practical section deals with the use of about a score of the more important reagents or groups of reagents. Numerous selected assay methods are given in detail, with attention to possible interferences. References are adequate in number, and both author and subject indexes are provided. An attempt has been made to cover the literature through early 1946.

Analysts who have access to the recently published comprehensive work by Welcher (Organic Analytical Reagents, 4 volumes, D. Van Nostrand Co., N. Y., 1940) will probably consider it unnecessary to acquire Flagg's book. This may also be true of those who own a copy of Prodinger (Organic Reagents Used in Quantitative Inorganic Analysis,



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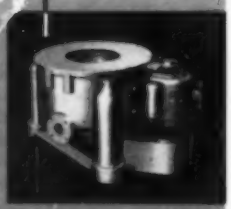
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Elsevier, N. Y., 1940) supplemented by abstracts from later journal literature. However, for those analysts who have been waiting for a clearly written one-volume work on organic precipitants, this book is strongly recommended.

Lab Manual

VACUUM MANIPULATION OF VOLATILE COMPOUNDS. *By Robert Thomas Sanderson. John Wiley & Sons, New York. 162 pages. $3.*

Reviewed by Frederick C. Nachod

DR. SANDERSON'S little booklet is exactly what is claimed in the subtitle: a laboratory manual for vacuum techniques. It is written in such a fashion that it should be extremely useful for the beginner and yet it will be of some help to the initiated worker, primarily because of its well-chosen references to the original literature and a number of handy appendices.

Those who know some glass blowing and who are familiar with pumps can omit the first forty pages of elementary introduction which can also be found in a number of other texts and pamphlets on those subjects (cf. Laboratory Glass Blowing, pamphlet by Corning Glass Works, Corning, N. Y.). The remainder deals with various measuring techniques, cooling baths, valves, etc., and several experimental lay-outs. Forty drawings provide for clarity in presentation and amplify the text.

While the approach and the treatment are definitively unsophisticated and complete coverage is not claimed by the author, it still seems perhaps in order to point out that such developments as the use of silicone oils in diffusion pumps, or of Pirani and ionization gages in vacuum measurements should have been mentioned briefly.

The booklet will appeal mostly to students embarking on thesis work in gas phase reactions, or perhaps to novices in industrial research. To them it can be recommended.

Bugs, Molds and Weeds

CHEMISTRY OF INSECTICIDES, FUNGICIDES AND HERBICIDES. *Second edition. By Donald E. H. Frear. D. Van Nostrand Co., New York. 417 pages. $6.*

IT USUALLY takes most of man's ingenuity to win the perennial local skirmishes against his ubiquitous pest and enemy, the insects. Even though we will almost certainly never be able to shout "the battle am in my hand," one thing is certain: new chemical weapons are making the fight more deadly to insects (and at times to us),

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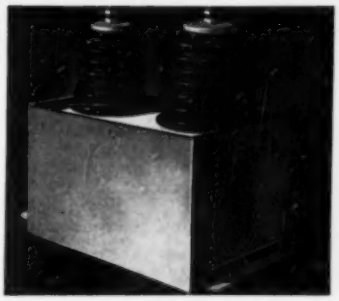
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The scope of this second edition of Frear's book is exactly what the title says—the chemistry of insecticides, fungicides and herbicides—just that and little more. It does not pretend to go into the details of manufacture, formulation, economics, specific uses or method of applying the various materials. These subjects are covered (somewhat) in the periodical literature.

If you are interested in the chemistry of economic poisons—from composition to methods of analysis—then you will want a copy of this book. But first a word of warning: don't expect this reference to answer all your questions about the latest synthetic organic material or to post on on last year's insecticide-of-the-month. If the field is moving fast for you, then its moving faster for any book, relatively speaking. But this work will be handy whenever you wish to pinpoint the status of our chemical knowledge of economic poisons—up until about early 1948.—*JRC*

RECENT BOOKS and PAMPHLETS

Standards of Hydraulic Institute. Eighth edition. Published by Hydraulic Institute, 90 West St., New York 6, N. Y. $3. Contains sections on centrifugal pumps, rotary pumps, reciprocating pumps and an entirely new section containing tentative standards on pipe friction.

Forum on Tractor Fuels. Special Technical Publication No. 82, published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 37 pages. $1. Proceedings of the meeting of Technical Committee L on tractor fuels of committee D-2. Six papers and discussions.

Hydrofluoric Acid. Chemical Safety Data Sheet SD-25, published by Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 5, D. C. 20 pages. 20 cents. Safe handling and use.

Capital Formation Under Free Enterprise. Published by the National Association of Manufacturers, 14 West 49th St., New York, N. Y. 88 pages. Sets forth the principles of capital formation and statistical estimates in this field.

Directory of Manufacturers in Oklahoma. Published by the Oklahoma Planning and Resources Board, 532 State

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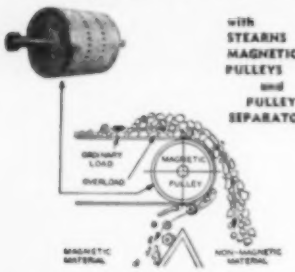


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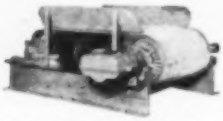


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Capitol, Oklahoma City, Okla. 250 pages. $2.50. Classifies manufacturers by (1) name of manufacturer, (2) type of product manufactured. Lists electric light and power companies.

Die Chemische Industrie und ihre Nebenprodukte. (4th edition, 1948.) Anon. Verlag für Wirtschaftsliteratur, Gmbh, Zürich. Available from F. F. Feigl, 157 Christopher St., New York 14, N. Y. $5. A directory of Swiss Chemical industry, listing Swiss firms, with their addresses, operating capital, key personnel and products.

Handbook of Uranium Minerals. By Jack DeMent and H. C. Dake. Published by the Mineralogist Publishing Co., Portland, Ore. 96 pages. $3. Occurence, detection, location and exploration of uranium and thorium minerals.

Modern Packaging Encyclopedia. Published by Packaging Catalog Corp., 122 East 42nd St., New York, N. Y. 950 pages. $6.50. Step-by-step arrangement of the stages in the planning and production of packaging.

Illinois Conference on Industrial Research. Published by the Armour Research Foundation, 35 West 33rd St. Chicago, Ill. 70 pages. Includes four major speeches on the relationship of research and industry.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, the pamphlet is free and should be ordered from the Bureau responsible for its issue.

Equipment for Dispersing Insecticides from Aircraft. By Frank S. Faulkner and C. C. Deonier. Bureau of Entomology and Plant Quarantine, ET-262.

Synthetic Organic Chemicals, United States Production and Sales, 1946. U. S. Tariff Commission Report No. 159, Second Series. Price 45 cents. The customary statistical booklet giving final returns of the annual survey.

Combined Typhus-Malaria Control Residual Spray Operations With Five Percent DDT Emulsion. By H. P. Nicholson, et al. Public Health Service Reprint No. 2878 from the Public Health Reports. Price 5 cents. A report of field trials.

Reports on Ground-Water Investigations Announced. U. S. Geological Survey. For release Dec. 30, 1948. This announcement lists most of the available reports which are available for consultation in the open files of U. S. Geological Survey. Copies of the individual documents are not available except for consultation; but interested engineers can determine from this list the principal items which are useful for local studies.

Spectral Transmissive Properties and Use of Eye-Protective Glasses. National Bureau of Standards Circular C471. Price 20 cents. Indicates basic data needed for selection of spectacles to protect eyes from intense radiant energy.

List of Publications on Wood Preservation. Forest Products Laboratory, No. R704. Available only from Forest Products Laboratory, Madison 5, Wis. List includes publications that give general information and the results of research by the Forest Products Laboratory, on preservative materials, methods of ap-

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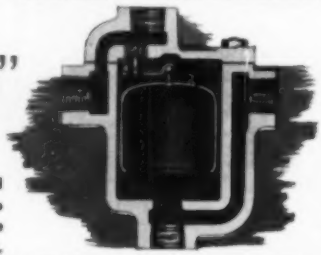
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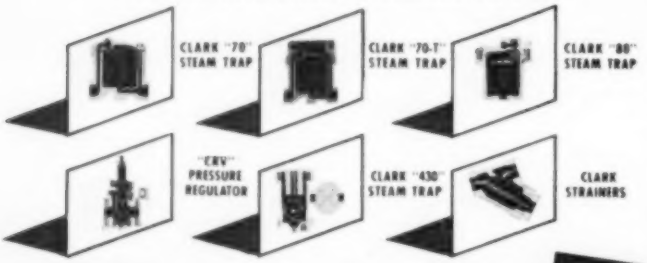
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Statistics of Natural Gas Companies 1947. Federal Power Commission, 8-66. Price $2. Available only from Commission. The annual statistical report giving details of the industry in convenient form for gas-using firms to identify sources available.

Statistical Abstract of the United States. Bureau of the Census. Price $2.75. Clothbound. A compendium of government and nongovernment statistics reflecting the social, industrial, political and economic conditions.

Report to the United States Atomic Energy Commission by the Industrial Advisory Group. For release December 30, 1948. Recommendations as to change in policy in dealings of Commission with private enterprise.

The Fertilizer Situation for 1948-49. U. S. Department of Agriculture. A statistical balance sheet of prospective supply and consumption of nitrogen, phosphate, and potash for fertilizer and of mixed fertilizer.

An Index of Shale-Oil Patents. Compiled by Simon Klosky. Bureau of Mines Bulletin 467. Price 75 cents. Illustrated resume with some significant claims of patents bearing on shale oil recovery and processing.

Amine Volatility and Alkalinity in Relation to Corrosion Control in Steam Heating Systems. By A. A. Berk and J. Nigon. Bureau of Mines Technical Paper 714. Price 20 cents. Report of experimental research and interpretation as to industrial significance.

Synthetic Liquid Fuels from Hydrogenation of Carbon Monoxide. By H. H. Storch, et al. Bureau of Mines Technical Paper 709. Price 50 cents. Part 1 of a series giving a review of literature on effect of catalyst preparation, reduction, and induction procedures on activity; correlation of physical properties of the catalysts with their activity.

Estimated Cost of Producing Heavy Fuel Oil by Hydrogenation of Coal. By L. L. Hirst, et al. Bureau of Mines Report of Investigations R. I. 4413.

Method for the Spectrochemical Determination of Beryllium, Cadmium, Zinc, and Indium in Ore Samples. By Graham W. Marks and Betsy M. Jones. Bureau of Mines Report of Investigations R. I. 4363.

Perlite: Thermal Data and Energy Required for Expansion. By E. G. King, et al. Bureau of Mines Report of Investigations R. I. 4394.

Shaped Charges Applied to Mining, Part 1—Drilling Holes for Blasting. By Hiram C. Draper, et al. Bureau of Mines Report of Investigations R. I. 4371.

Production of Lightweight Concrete Aggregates from Clays, Shales, Slates, and Other Materials. By John E. Conley, et al. Bureau of Mines Report of Investigations R. I. 4401.

Survey of Commercial Aviation-Gasoline Characteristics January 1948 Production. By W. C. Holliman, et al. Bureau of Mines Report of Investigations R. I. 4424.

Survey of Commercial Aviation-Gasoline Characteristics July 1948 Production. By W. C. Holliman, et al. Bureau of Mines Report of Investigations R. I. 4435.

Gas Hydrates and Their Relation to the Operation of Natural-Gas Pipe Lines. By W. M. Deaton and E. M. Frost, Jr. Bureau of Mines Monograph 8. Available from the American Gas Association at $1 for members and $1.50 for nonmembers.

Using 2,4-D Safely. Prepared by L. S. Evans, et al. U. S. Department of Agriculture Farmers' Bulletin No. 2005. Price 5 cents. Gives precautions for protection of nearby crops and limited precautions on hazards for men and animals.

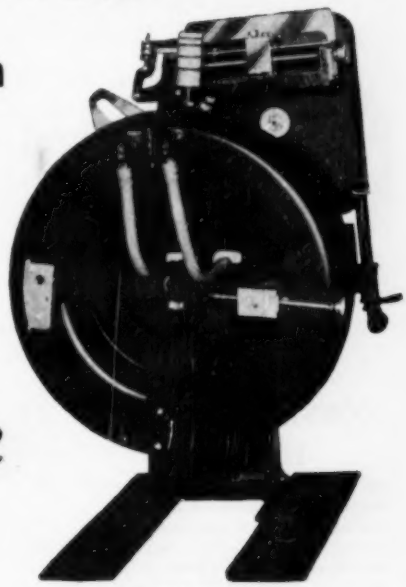
Control of Wireworms in Irrigated Lands With Ethylene Dibromide. By William C. Cook, et al. Bureau of Entomology and Plant Quarantine, EC-6. Describes methods of application and expectable results.

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MANUFACTURERS' LATEST PUBLICATIONS

Chemical Engineering's Reader's Service, in cooperation with manufacturers, makes it possible for you to secure catalogs, bulletins, and other publications herein listed without obligation (unless a price is specifically mentioned). For your convenience, publications may be obtained by using Reader Service Coupons on pp. 169-170.

(Continued from page 170)

tubular heaters, coolers, condensers, and heat exchangers produced by this company. Drawings are shown of the various types of shells, tube bundles, stationary heads and floating heads available. Charts are also included for convenient solving of mean-temperature-difference problems.

114. Explosives. Olin Industries, Inc., Alton, Ill.—64-page bulletin is a complete catalog of the explosives and their auxiliaries produced by this company. The booklet also gives technical data for users of explosives and a section of safety precautions.

115. Coupling Selector. Falk Corp., Milwaukee, Wis.—This slide-rule type coupling selector automatically gives the proper flexible coupling to be used when horsepower and revolutions per minute are known. Different factors are given for different types of machinery to be driven.

116. Conveyors. H. J. Ferguson Co., Jenkintown, Pa.—24-page catalog lists the complete line of gravity wheel conveyors produced by this company. Specifications and capacities of these conveyors are given.

117. Thermocouples. Wheelco Instrument Co., Chicago, Ill.—46-page bulletin No. TC7 catalogs the complete line of thermocouple assemblies, wire and accessories produced by this company. Prices of each of these items are included. The latter part of the booklet contains electrical data on various materials from which couples may be made.

118. Aroclors. Monsanto Chemical Co., St. Louis, Mo.—28-page bulletin No. P-115 describes the properties and applications of the series of chemical products called Aroclors. These chemicals are a series of chlorinated biphenyl and chlorinated poly-phenyls.

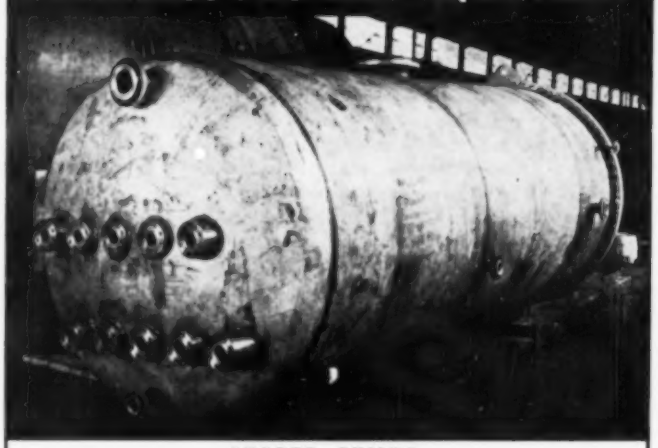
119. V-Belts. B. F. Goodrich Co., Akron, Ohio—4-page catalog section No. 2170 describes the Multi-V belts produced by this company. Standard sizes and dimensions are shown together with design data for designing belt drives.

120. Silanes. Linde Air Products Co., New York, N. Y.—4-page catalog sheet lists the physical properties and characteristic reactions of two silanes produced by this company, ethyl trichlorsilane and amyltrichlorosilane. Availability of these materials and present shipping containers are given.

121. Dehumidification. Pittsburgh Lectrodryer Corp., Pittsburgh, Pa.—Bulletin 214 is a paper dealing with important recent developments in the use of solid adsorbents for the control of humidity. The bulletin was written by Professors Queer and McLaughlin of Pennsylvania State College.

122. Air Conditioning Unit. Worthington Pump & Machinery Corp., Harrison, N. J.—8-page bulletin No. C-1100-C33 describes the air conditioning units produced by this company for commercial and industrial applications. Specifications and dimensions of the units are

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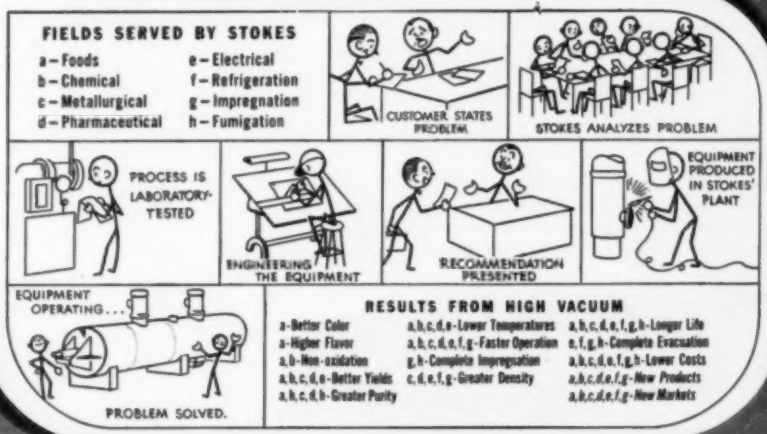
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ARE PART OF THE MODERN EQUIPMENT OF ONE OF THE MOST MODERN EASTERN CHEMICAL PLANTS

The stored hydrochloric acid is contaminated with organic acids and solvents . . . and these Atlas tanks are completely proof against this punishing combination. Please note that we said "*proof against*" . . . not just "resistant to".

The design is Atlas DUAL CONSTRUCTION (Patented), a better way of building tanks to handle fighting corrosives . . . and one which offers advantages and economies unavailable in any other type of construction.

Name your corrosives and Atlas will provide construction best suited to withstand their attacks.

Atlas Materials include cements, plastic linings, jointing materials and protective coatings . . . used in tanks, floors, fume ducts, drains, neutralizers, etc. These Atlas materials are immune to acids, alkalis, solvents, water, steam and elevated temperatures.

Atlas Service includes specification writing, analysis of design, supervision and installation. Our engineers will gladly work with you, submitting plans and estimates without obligation. Get in touch with the Atlas representative at our nearest office. Meantime, write our head office here at Mertztown for Bulletin C2-2

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*Stock carried at these points

IN CANADA: Atlas Products are manufactured by H. L. BLACHFORD, Limited, 977 Aqueduct Street, Montreal 3, P. Q., 86 Bloor St. W., Toronto, Ont.

given. These units range from 4 to 62 tons of refrigeration capacity.

123. Conveyors. Link-Belt Co., Chicago, Ill.—48-page bulletin No. 2230 describes various applications for the overhead trolley conveyors produced by this company. Samples are shown of applications in warehouses, foundries, textile mills, and other types of industrial plants.

124. Packaged Boilers. Cyclotherm Corp., New York, N. Y.—6-page bulletin No. P-1 describes the packaged oil or gas boilers produced by this company. The standard units range from 10 to 300 hp. in capacity.

125. Stainless Steel Equipment. Chicago Stainless Equipment Corp., Chicago, Ill.—38-page catalog No. 502 describes the various types of tanks and kettles produced by this company of stainless steel. The kettles shown can be equipped with jackets or with coils. The majority of them contain agitators.

126. Instruments. Taylor Instrument Co., Rochester, N. Y.—A completely revised edition of the "Taylor Guide to Correct Instrument Selection" has been published as Bulletin No. 98170. The bulletin reviews the line of instruments produced by this company and describes the field of application as well as the principle of operation and range limits of each instrument.

127. Wire Screen. Cambridge Wire Cloth Co., Cambridge, Mass.—This 4-page brochure describes the wedge type wire screens produced by this company and also the riffle surface screen for use in dewatering. The wedge type screens are claimed to have greater freedom from clogging and to give more efficient screening.

128. Pumps. Fairbanks, Morse & Co., Chicago, Ill.—8-page bulletin No. 5135-4 describes the rotary pumps produced by this company. They are designed for free-flowing liquids and have capacities that range from 1 to 450 gpm.

129. Waste Neutralization. National Lime Association, Washington, D. C.—A new bulletin entitled "The Use of Lime Versus Caustic Soda and Soda Ash as Acid Neutralizing Agent" gives a cost study of some of the most common uses of neutralizing agents. Typical examples of the neutralization of acid wastes are given.

130. Permanent Magnets. Dings Magnetic Separator Co., Milwaukee, Wis.—4-page Bulletin No. 3-1205A describes the types of permanent magnets produced by this company and indicates typical installations for them. Various applications are indicated.

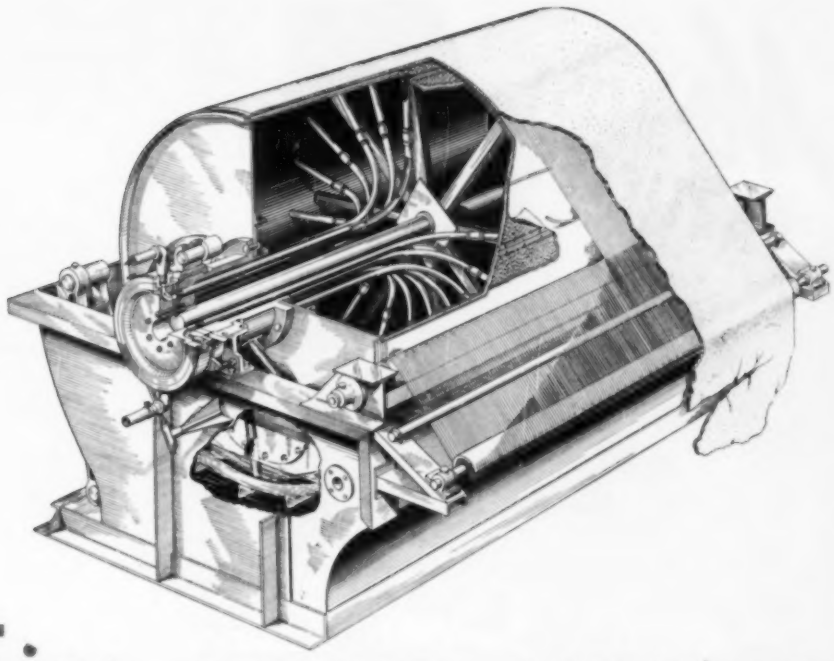
131. Humidifiers. Armstrong Machine Works, Three Rivers, Mich.—12-page Bulletin No. 1771 describes the steam humidifier produced by this company for automatically controlling relative humidity. Various applications are shown for these humidifiers which can be either air or electrically controlled. Prices and capacities of the standard units are given together with the amount of steam required by the units. Methods of installation are also shown.

132. Reducing Valves. A. W. Cash Valve Manufacturing Corp., Decatur, Ill.—8-page bulletin No. 265 gives specifications and prices for the Type B pressure reducing valves produced by this company. The valve is available in sizes from ¼ in. to 2 in. Capacity nomographs are included for operation of this valve on water, steam and air.

133. Instrumentation. Republic Flow Meter Co., Chicago, Ill.—32-page data book No. 1001 describes the pneumatic transmitters produced by this company for remote measurement of flows, pressures, levels and densities. Examples of methods of operation and installation are included.

134. Vibrating Screens. Allis-Chalmers Co., Milwaukee, Wis.—8-page Bulletin No. 07D744 describes the line of electromagnetic vibrating screens produced by this company. The screens are claimed to size any granular material from 10 to 48 mesh (dry) or 65 mesh (wet).

135. Pumps. Worthington Pump & Machinery Corp., Harrison, N. J.—Two new bulletins describe two of the types of



FEinc STRING DISCHARGE

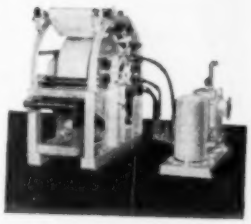
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18

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FOR MORE INFORMATION
See Reader Service
Coupon on pages 169-170

centrifugal pumps produced by this company. The first, 12-page bulletin W-305-B1A, describes the standard centrifugal pump produced by this company for pumping water and similar liquids. This pump is available in cast iron or bronze construction. Complete dimensions are given. The second bulletin, 8-page bulletin W-350-B2E, describes the centrifugal pump manufactured of Antaciron, a high silicon iron for use in pumping acids and acid chlorine. Dimensions and capacities of these pumps are given.

136. Grinders. Hardinge Co., York, Pa.—4-page brochure No. AH-387 describes the various types of grinders and pulverizers produced by this company. Included are rod mills, conical mills, batch mills, tube mills and cylindrical mills. Actual installations of these various types of mills are shown.

137. Gas Combustion Equipment. Bryant Heater Co., Cleveland, Ohio—Five new data sheets have been issued by this company, the first two covering blowers and boosters, and the latter three burners. Complete capacity ratings and dimensions are given for the blowers and boosters.

138. Unit Heaters. Ilg Electric Ventilating Co., Chicago, Ill.—Catalog No. 348 describes the various types of unit heaters produced by this company. They are available in horizontal, low-ceiling, vertical and textile types and can be operated on steam pressures from 2 to 100 lb. Engineering data and information on proper installations are included.

139. Valves. Edward Valves, Inc., East Chicago, Ind.—8-page catalog No. 12-H describes the pressure sealed cast steel valves produced by this company. Non-return and check valves are also included. Complete dimensions are shown for these valves which may be operated at pressures up to 2,000 psi.

140. Boilers. Alert Engineering Products, Detroit, Mich.—6-page bulletin No. 748 describes the vertical fire-tube boilers produced by this company as a package unit. These boilers may be gas or oil fired and are produced in sizes from 2 to 50 hp.

141. Ore Machinery. Nordberg Manufacturing Co., Milwaukee, Wis.—8-page bulletin No. 149 describes the various types of machinery produced by this company for processing ores and minerals. Included are crushers, screens, grinders, rotary dryers, kilns, and flakers. Sizes and capacities are shown for the crushers.

142. Pumps. Ampco Metals, Inc., Milwaukee, Wis.—4-page bulletin No. 85 describes the centrifugal pumps manufactured by this company of its aluminum bronze alloy Ampco. Design features and advantages of these pumps are given.

143. Chemicals. Standard Oil Co. (Indiana), Chicago, Ill.—6-page bulletin lists the chemical products produced by this company which include alkanesulphonic acids, hydrocarbons, nonyl alcohols, plasticizers, and polybutenes. Brief data are given on the chemical properties of these materials.

144. Vinyl Resins. Enjay Co., New York, N. Y.—10-page bulletin describes the properties of plastics which are a mixture of polyvinyl chloride and the nitrile synthetic rubber, Perbunan. Methods of mixing these materials are given as well as methods of producing finished products.

145. Bearings. Graphite Metallizing Corp., Yonkers, N. Y.—8-page bulletin describes the self-lubricating bushings produced by this company. The various materials of which these bushings may be manufactured are listed.

146. Valves. Homestead Valve Manufacturing Co., Coraopolis, Pa.—4-page book-

How SWENSON

SPRAY DRYING

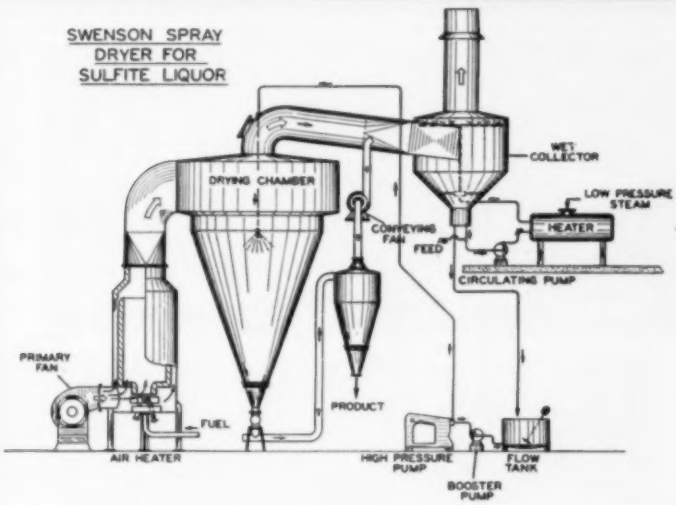
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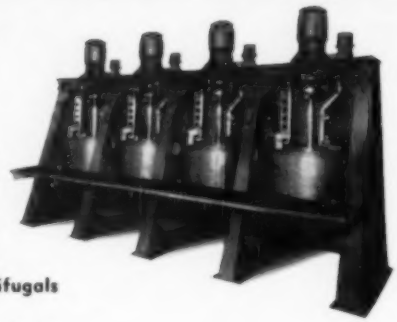
A similar flow sheet is applicable to nonedible starch hydrolysis products, tannin extract, and various inorganic salts.



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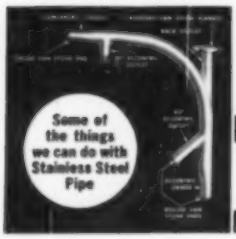
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PIPING FABRICATORS AND CONTRACTORS

let describes the lubricated plug valves produced by this company. Specifications of these steel valves are given together with prices. The valves are designed for 150-lb. working pressure.

147. Shaft Seals. National Motor Bearings Co., Redwood City, Calif.—36-page catalog No. 101 describes and gives the specifications for the various types of oil and fluid seals produced by this company. Synthetic rubber products manufactured by this company are also described.

148. Steam Jets. Schutte & Koerting Co., Philadelphia, Pa.—16-page bulletin No. 4-E describes the line of steam jet exhaustors and compressors produced by this company. Various applications are shown and complete capacities, dimensions and price data are included.

149. Swing Boom Crane. Silent Hoist & Crane Co., Brooklyn, N. Y.—4-page bulletin No. 79 describes the mobile swing boom crane produced by this company. It is available in four sizes, 1½, 2½, 5 and 10-ton capacities. Complete specifications for each of these units are given.

150. Sorbitol. Atlas Powder Co., Wilmington, Del.—28-page booklet describes the use of Sorbitol as a polyol in the production of solid and liquid vehicles for protective finishes. Methods of use are given for hard gums, varnishes, tall oil acids, synthetic drying oils and resins.

151. Stainless Tanks. Filter Paper Co., Chicago, Ill.—6-page bulletin No. SFT-10147 describes the standard line of stainless steel tanks produced by this company. Capacities and dimensions are given for open top tanks, closed top tanks and horizontal tanks. Other specialized tanks are also mentioned.

152. Protective Coatings. Dampney Co., Boston, Mass.—4-page buletin No. 1530 describes the protective coatings produced by this company for use in boilers and other equipment where wet-heat service is encountered. Methods of application are given.

153. Valves. H. K. Porter Co., Pittsburgh, Pa.—16-page booklet describes the line of lubricating plug valves produced by this company. Complete specifications and list prices are given for these valves, manufactured of both steel and stainless steel. Pressure ranges for these valves are from 175 to 500 lb.

154. Protective Coatings. United Chromium, Inc., New York, N. Y.—4-page bulletin lists typical applications for the various protective coatings produced by this company. A brief description of each of these materials is also included.

155. Hydraulic Cylinders. Ledeen Manufacturing Co., Los Angeles, Calif.—Data sheet No. CS148 illustrates the application of hydraulic cylinders in controlling a gate valve from a remote location.

156. Mixers. Sprout-Waldron & Co., Muncy, Pa.—4-page bulletin VA-948 describes the three standard sizes of vertical mixers produced by this company. Complete specifications are given for these units which come in 50, 100 and 150-cu. ft. sizes.

Requests for the following publications must be on company letterhead and sent directly to the manufacturer.

Chlorine. Pittsburgh Plate Glass Co., 5th Ave. at Bellefield, Pittsburgh 13, Pa.—72-page bulletin is a complete manual of technical data and methods of handling and unloading of chlorine. Diagrams and piping layouts are shown for typical chlorine unloading installations. The physical properties section includes corrosion information as well as information on the preparation of soda bleach liquors and lime bleach liquors.

Process Equipment. General Ceramics & Steatite Corp., Keasbey, N. J.—12-page bulletin No. CHE-R3 describes the line of chemical process equipment manufactured by this company of stoneware, porcelain, and impregnated graphite. Dimensions and specifications are given for such types of equipment as towers and tower packing, pumps and exhausters, agitated kettles, tanks, and valves and pipe.

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Further assurance of quick, easy operation is the fact that all HOMESTEAD LEVER-SEALD VALVE operating parts are protected from line contents in both the open and closed positions. Corrosion or erosion of valve seating surfaces is therefore reduced to a minimum.

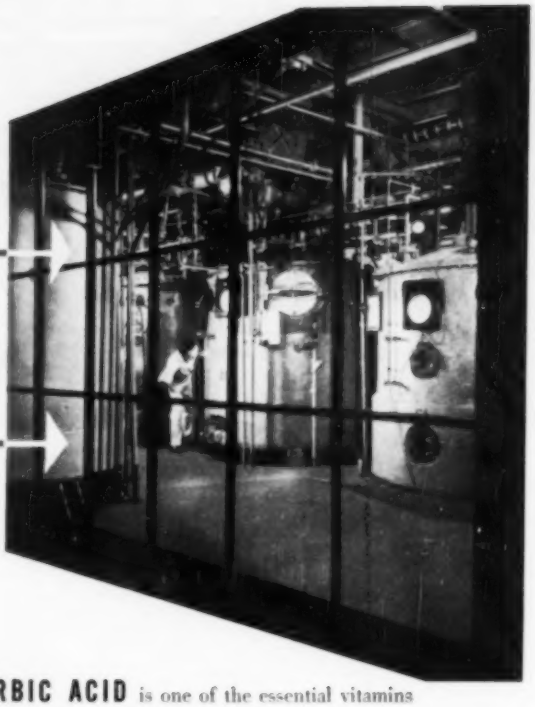
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CHEMICAL ECONOMICS

Richard F. Warren, ASSISTANT EDITOR

Capital Expenditures Continue to Run Above the Billion Dollar Level in Chemical Industry

MANY feel that capital investments have been far above normal. They know industry has been catching up on projects postponed during the war. With completion of these expansions, they have looked for a sharp break in purchases of plant and equipment. But the evidence disclosed by a new McGraw-Hill survey points the other way. It shows that industry needs to go on investing at a high level in both new plants and equipment. The survey shows that industry plans to spend $55 billion between 1949 and 1953. This may be compared with a total value of existing manufacturing facilities which the survey places at $96 billion. It would cost $136 billion to replace these facilities with the latest modern equipment.

The chemical industries are continuing to invest in new plants and equipment at a high rate but they are continuing a seemingly perpetual expansion, rather than a postwar expansion program. Last year the emphasis was on expanding capacities, but now most manufacturing plants have enough capacity to handle existing orders. Investment programs are being directed at more efficient operation through modernization.

Physical capacities in the chemical industry grew 45 percent from January 1946 to December 1948. According to the survey a further increase of 35 percent is planned in the 1949-53 period. The estimates are based on replies of companies that employ more than 60 percent of the workers in the industries where there are highest capital investments per worker. These include chemicals, petroleum, railroads, utilities, steel, electrical machinery and automobiles. These seven industries account for more than 75 percent of capital expenditures in all United States industries. Survey coverage in other industries was smaller, but companies studied were carefully selected to get a good cross-section.

The major findings of the survey, based on the assumption that companies will carry out present plans if a high level of prosperity continues, show that manufacturing industries will spend $7.2 billion for new plants and equipment in 1949. Chemical industries plan to spend $1.2 billion this year. They will spend at least $1.1 billion for each of the next five years. About 50 percent of this capital outlay will be on expansion of current facilities and the rest will be spent on replacement and modernization.

Three out of four manufacturing companies say that equipment should pay for itself in five years or less. Approximately 77 percent say new buildings should be paid off in 15 years or less. How does thinking in the chemical industry compare with this picture? Chemical companies gave the following replies—10 percent said equipment should pay back its cost in two years, 20 percent agreed that three years were enough, 60 percent would go along with five years or less, and all said it should be written off in ten years or less. (See page 102.)

High construction cost is one of the reasons given by about one-half of the chemical firms for holding up new construction. However, 30 percent say that they would step up building if costs dropped one-fifth.

Where is the money coming from? In the chemical industry, 73 percent plan to finance their capital expenditures from profits and reserves. The rest plan to borrow part of the needed funds. In the big picture, some 15 percent of manufacturing firms expect to borrow, only 9 percent plan to sell stock. But 20 percent would like to sell stock and only 4 percent want to borrow.

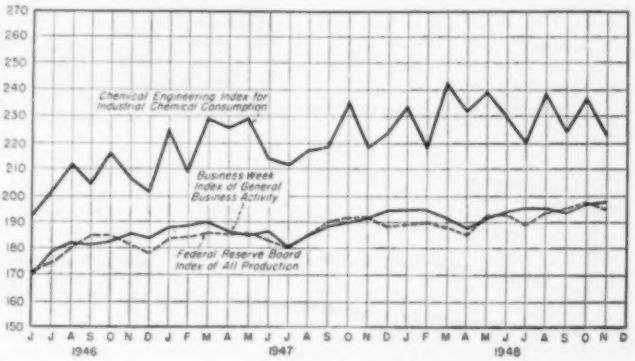
A more liberal depreciation allowance (for income tax purposes) would prompt almost two-thirds of them to increase their capital expenditures. A third of the manufacturing companies say that they would increase their expenditures if they could sell stock at ten times earnings.

Chemical Engineering Index

Industrial Consumption of Chemicals

1935 = 100

	October (Revised)	November
Fertilizers	55.10	51.30
Pulp and paper	25.28	24.91
Petroleum refining	22.30	22.20
Glass	21.20	17.55
Paint and varnish	22.65	19.85
Iron and steel	14.65	14.28
Rayon	26.95	27.21
Textiles	10.38	10.15
Coal products	10.60	10.58
Leather	4.53	4.25
Explosives	8.66	8.16
Rubber	5.20	5.21
Plastics	9.36	8.65
INDEX	236.86	224.40



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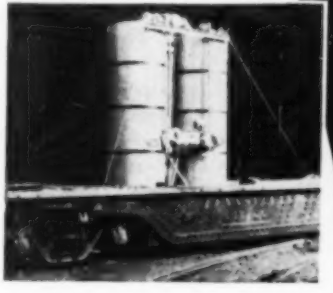


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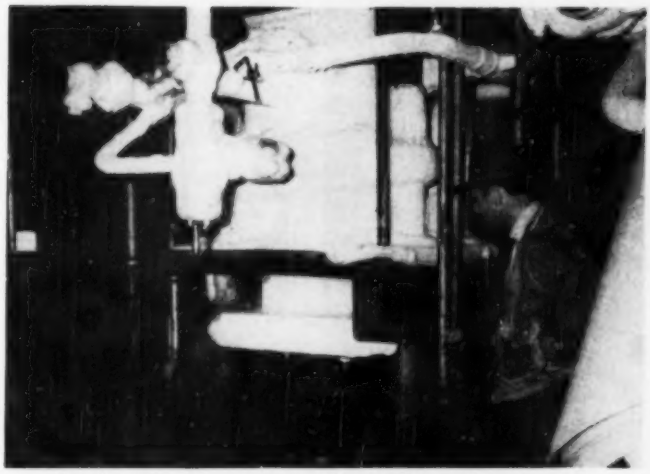


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Dry Ice



MARKETS for carbon dioxide in the solid form are growing and are becoming more numerous. Demand exceeds supplies. Unlike many chemicals, dry ice is far from a buyer's market. Among its major uses, refrigeration is the largest (80-90 percent). However, it also finds a wide use as a source of supply for CO_2 in carbonated beverages and CO_2 gas used in forming inert atmospheres in several industries. It also is used in the production of rubber. It serves as a dehydrating agent in production of some gases and organic liquids where it freezes out the water. Radio and neon tubes are evacuated with the aid of dry ice. Gummy materials are frozen with dry ice to permit grinding. Aluminum rivets are aged with dry ice. A new use for this chemical has been found in rain making. As a result of considerable experimentation it has been shown that when proper meteorological conditions are present, this may be carried out successfully.

Carbon dioxide is obtained from coke, limestone, fermentation gases, or some natural wells. From these raw materials, it can be seen that it would be natural for alkali producers to enter this field. Among the major producers are Wyandotte Chemical Corp. at Wyandotte Mich., Mathieson Alkali, Saltville, Va., Diamond Alkali Co., at Painesville, Ohio, and Southern Alkali at Lake Charles, La.

Among the other major producers are Monsanto Chemical Co. at Everett, Mass., Du Pont at Deepwater, N. J., Publicker at Philadelphia, Pa., Commercial Solvents at Peoria, Ill., and Agnew Calif., U. S. Industrial Chemicals at Baltimore, Md., and an Air Reduction subsidiary, Pure Carbonic Corp., which has about 15 plants scattered around the country. Liquid Carbonic, Inc., has about 12 plants located in various parts of the nation. Carbide makes it at Niagara Falls. In all, there are nearly 50 plants operating in the United States.

In the future it is very likely that the growth of new plants will come in a pattern that follows the railroads. This is due to the fact that many railroads would like to see a movement to dry ice for refrigeration since it would cut down on the corrosion problems created by brine dripping on tracks and bridges. It would also increase the payload capacities of the refrigerator cars. About 1,000 lb. of solid CO_2 will refrigerate an average car for a transcontinental trip. To refrigerate a similar load with water ice and salt requires 3,700 lb. initially and this will probably be supplemented several times before the car reaches its destination. Aside from these factors there is a new and compelling reason for more dry ice plants.

The recent basing point decisions have created the need for more dispersion. If it costs a large firm $10 per ton to make the product which sells for a very moderate price, shipping costs become an important factor in distribution. Recent FTC rulings therefore tend to limit the market areas of the bigger producers. Storage of this material is also a problem. The sublimation losses over a period of time add to the overhead. It does have a major advantage over the cylinder CO_2. If the chemical is shipped in returnable cylinders the cost of container freight is greater than the freight paid on the product. In addition to this factor, valves on the cylinder are usually replaced on about every fourth trip at a cost of $15 each. This is another reason for the trend toward the use of the solid as a source of CO_2 gas. Proof of this trend can be seen in the data published by the government. In 1931 there were 154 million pounds of liquid and gas type CO_2 produced. Only 84 million pounds of solid CO_2 were made in that year. In 1947 there were 244 million pounds of liquid and gas type made compared with 723 million pounds of solid. This reversal of the positions of relative importance began in the early thirties and production of dry ice has continued to walk away from the other types.

When dry ice was first produced, it was more or less a laboratory curiosity with no established applications, no general knowledge of the product or how it should be handled and controlled to get full efficiency from its use. There was no satisfactory equipment, but primarily no method of distribution.

This meant that while millions of tons of CO_2 gas were wasted into the air continually, this waste could be turned into dry ice with the proper equipment. Production of the dry ice itself was comparatively simple, but distribution was a different matter.

This was the problem that confronted the large chemical companies, who were first to enter the field using the Cole-McLaren patents.

By this method, the cost was brought down to point where the finished product could be sold at a profit, at less than 3c. per lb., contrasted with the price under the old method of from 12 to 20c.

In order to market this new product there were two alternatives. They could set up a complete new sales organization and make a very large investment in insulated delivery equipment and storage containers. The other choice was to sell the product at the platform to a distributor who was already set up with the necessary sales force and delivery equipment.

At the start, there was no organiza

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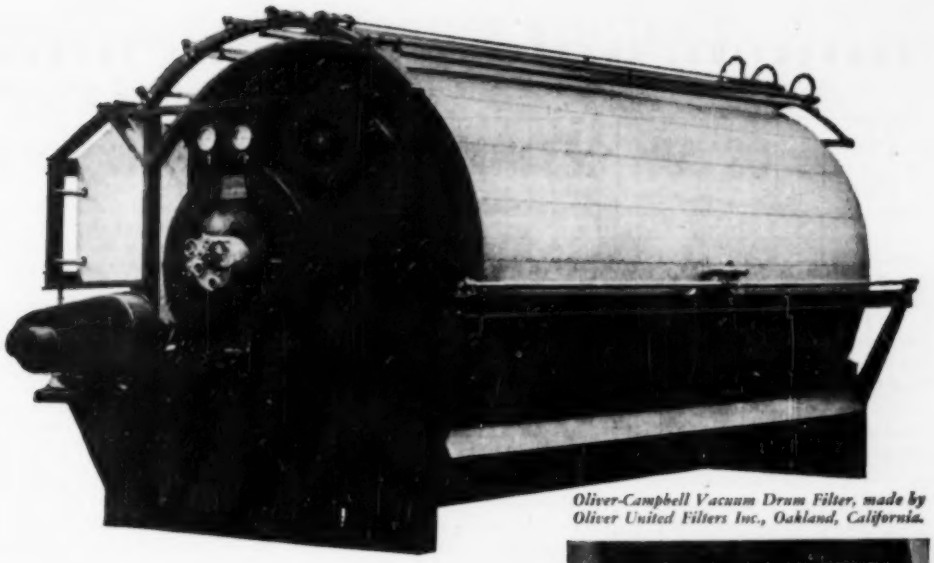
tion in a position to market the tonnage of ice that immediately became available. Consequently, the most progressive of these companies set up their own distribution department and did much to promote the use of this then-new refrigerant.

The present tonnage of solid CO_2 is many times greater than it was ten years ago, and more plants are coming into production. With distribution outfits set up and well organized, and by reason of the increased production, combined with the sales promotion work of producers and distributors, a demand has been created that may be several times that of the tonnage that is now available.

Because of this change in the distribution set-up, it is no longer necessary for a plant having waste or by-product CO_2 gas, whether from fermentation, from lime burning, from oil, or any other source, to worry much about the selling of the product. Distributors all over the country are searching for more tonnage to take care of their customers and their increased demands.

Existing plants are scattered rather broadly across the country in strategic positions adjacent to ready-made markets. However, there is still a need in sections where production does not take care of existing demand.

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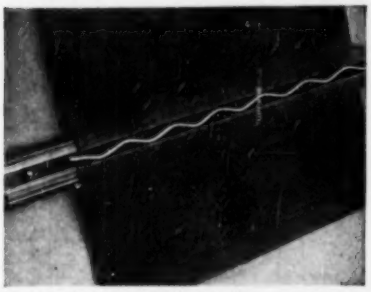


Oliver-Campbell Vacuum Drum Filter, made by Oliver United Filters Inc., Oakland, California.

6 types of REVERE METALS in this vacuum drum filter

In the manufacture of this Oliver-Campbell Sugar Cane Mud Filter the following Revere Metals are used: Copper sheet, copper tube, brass sheet, brass discs, brass pipe, and brass extruded shapes. These metals are chosen for three chief reasons: they resist the corrosive action of the filtrate and cake, their mechanical strength is such as to assure durability, and they are quickly and economically fabricated. Use of extruded shapes is particularly interesting from a fabrication standpoint, the rather complicated forms required for the division strip being supplied by Revere in straight lengths that require only cutting and drilling before installation. Similarly, the zig-zag caulking strip that holds the screens is a Revere rectangular extrusion that needs only cutting plus formation of the zigs and zags. The screens, incidentally, are copper sheet, perforated 625 holes to the square inch.

Filtration is an important process, not only in sugar mills, but in a great many industries, such as chemicals, petroleum, coal, paper, cement, mining and refining, breweries, sewage disposal. Often both filtrates and sludges are corrosive, and thus it is that Revere Copper and copper alloys find many important applications. These metals are available in many different alloys and forms, resistant to a wide range of corrosive media. The Revere Technical Advisory Service will gladly collaborate with you in studying the problem of corrosion in your plant equipment or product.



Section showing method of locking copper screen into the extruded division strip by means of a zig-zag brass caulking strip.



Detail of formed or "bumped" brass screen support. The division strips are extruded brass sections.

REVERE

COPPER AND BRASS INCORPORATED

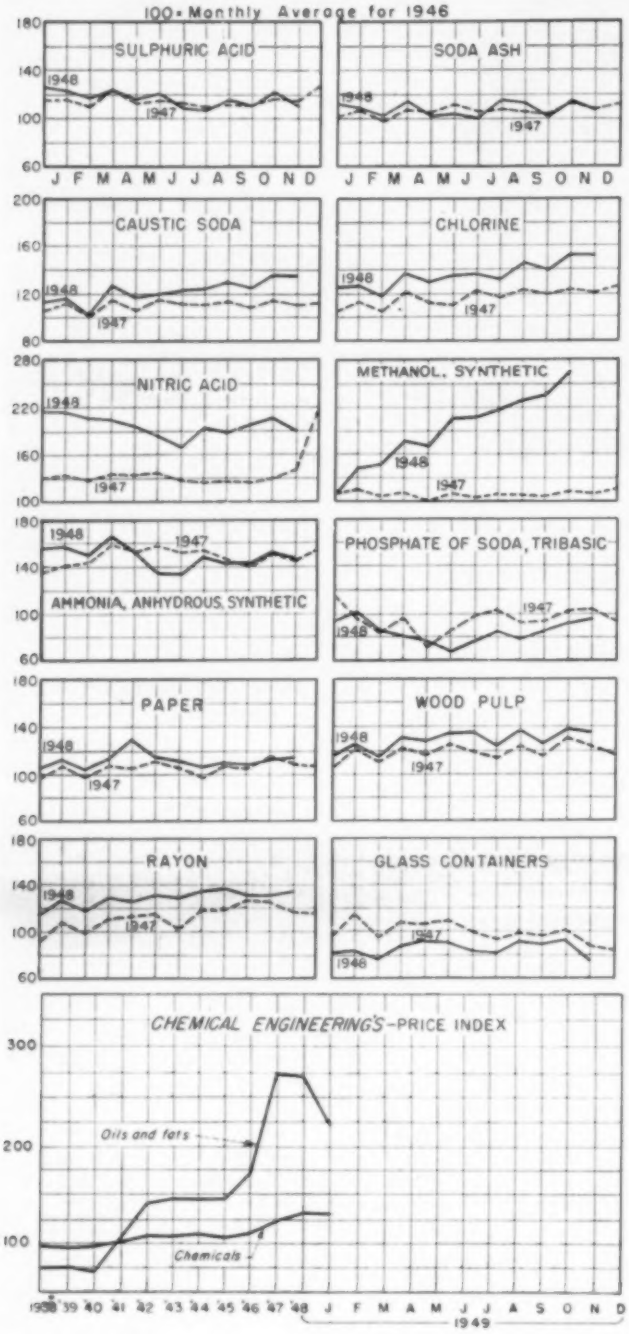
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PRODUCTION, CONSUMPTION AND PRICE TRENDS



SULPHURIC ACID production passed the 10,000,000 ton mark last year to set a new record in output. It paced the entire industry as 1949 production got off to a good start.

Last year several new organic chemicals were introduced on a commercial scale as this part of the process industries continued its steady growth in both volume of existing products and number of commercial-scale chemicals produced. Shell brought in the first alcohol from ethylene unit and Union Oil Co. of California is making headway with its plans to build an ethyl alcohol plant at Wilmington, Calif. This unit will also use ethylene as the raw material. Shell expanded its Dominguez isopropyl alcohol and acetone facilities by more than 30 percent. These are only a few of the events that made 1948 a good year and point to another good year ahead.

In addition to the growth in the larger heavy inorganics, Westvaco has pushed construction of one electric furnace at Pocatello, Idaho, and is planning a second. This coming output will supplement expansions in this line which were completed recently by other phosphous producers.

Glass containers shipments dropped off from their September level of 10.6 million gross to 8.4 million gross in October and production fell to 7.3 million gross in November. Preliminary estimates on 1948 output indicate that about 100 million gross were produced last year.

Price trends

Pricewise, ethyl alcohol held the spotlight again last month as it fell to a new seven-year low. By the first of February, SD.1 was down to 32½c. per gal. For a behind-the-scenes story see page 126. *Chemical Engineering*'s price indexes continued their downward trek in January. Oils and Fats index is at the lowest point that has been recorded in the past 28 months. Chemicals price trends were mixed last month but the weighted index moved downward as declines continued to overbalance the gains.

Chemical Engineering

WEIGHTED INDEXES OF PRICES

Base = 100 for 1937

	Chemicals	Oils & Fats
As of February 1	129.22	199.61
Last Month	130.47	224.33
February 1948	127.56	291.41
February 1947	123.47	317.78

When You Need MORE CORROSION RESISTANCE

in Handling Sulphuric and Many Other Acids—

Use the *NEW Carpenter* STAINLESS NO. 20

For an Extra Margin of Safety!

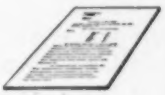
For the first time, this Stainless is available in the forms of bars, wire, strip and tubing.

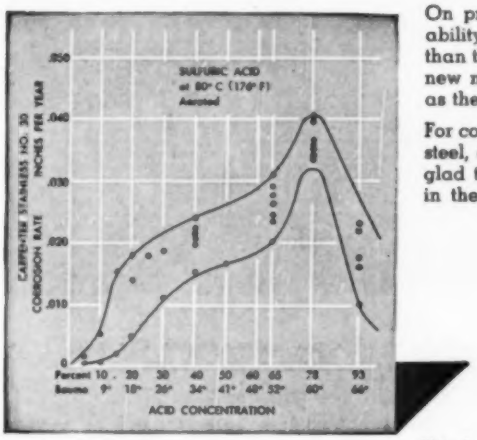
If you are familiar with this alloy in its cast form, known as Durimet 20, you have a good idea of the corrosion resistance provided by Carpenter Stainless No. 20. Now that Carpenter's research has solved the problem of producing this Stainless in wrought forms, the material can take on new and important jobs.

In addition to its excellent resistance to sulphuric acid, Carpenter Stainless No. 20 is well suited for the handling of other acids and corrosive agents. For example, it is used in the handling of acetic, nitric and crude phosphoric acids, black liquor, calcium phosphate, etc.

On production jobs experience has shown that the machinability characteristics of Carpenter Stainless No. 20 are better than those of Stainless Types 316 and 317. Thus, the use of this new material can contribute to fabricating economy as well as the service life of equipment.

For complete information on the properties of this new Stainless steel, drop us a note on your company letterhead. We will be glad to put a set of Carpenter Stainless No. 20 Data Sheets in the mail for you.





This chart shows the ability of Carpenter Stainless No. 20 to resist the corrosive effects of sulphuric acid at temperatures of 80°C (176°F). The danger zone, indicated by the "hump", is in the range of 65-93% sulphuric acid at 80°C (176°F). In this range the conventional 18-8 Cr-Ni-Mo austenitic steels (Types 316 and 317) show corrosion rates many times greater than illustrated here. While Carpenter Stainless No. 20 shows accelerated corrosion, it is far superior to the 18-8 grades and is satisfactory for most of this concentration range.

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Carpenter

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United States Production of Certain Chemicals

October 1948, October 1947 and Ten-Month Totals for 1948 and 1947

Chemical (Tons unless otherwise noted)	October 1948	October 1947	Total, Ten Months 1948	Total, Ten Months 1947
Ammonia, synthetic, anhydrous[1]	92,791	95,926	896,560	922,613
Ammonium nitrate	84,128	88,249	825,652	868,236
Ammonium sulphate, synthetic (M lb.)	38,900	37,624	292,495	327,750
Calcium carbide, commercial	57,805	48,336	570,606	515,432
Calcium phosphate:				
Monobasic (M lb.)	6,294	7,343	59,919	52,874
Dibasic (M lb.)	8,296	8,041	65,772	62,581
Carbon dioxide:				
Liquid and gas (M lb.)	17,988	21,547	212,230	210,660
Solid (M lb.)	53,148	58,469	606,489	583,764
Chlorine	147,593	127,245	1,319,111	1,294,458
Chrome green (M lb.)	1,041	1,195	10,671	12,233
Chrome yellow and orange, (C.P.), (M lb.)	4,080	4,790	40,670	40,433
Hydrochloric acid	29,963	36,461	355,522	359,291
Hydrogen (M cu. ft.)	2,563,000	2,038,000	22,856,000	16,516,000
Lead arsenate, acid and basic (M lb.)	.....	.....	.....	.....
Molybdate chrome orange, (C.P.), (M lb.)	526	433	4,552	.....
Nitric acid	99,190	99,316	945,375	939,038
Oxygen (M cu. ft.)	1,431,000	1,314,000	13,153,000	11,330,000
Phosphoric acid (50% H_3PO_4)	113,337	99,213	902,567	838,352
Soda ash:				
Ammonia-soda process:				
Total wet and dry[2]	406,603	386,609	3,771,268	3,749,667
Finished light[3]	198,369	192,021	1,609,170	1,718,925
Finished dense	146,431	145,846	1,278,639	1,405,094
Natural[4]	28,328	28,325	255,618	231,893
Sodium bicarbonate, refined	14,407	13,992	135,432	181,409
Sodium bichromate and chromate	8,480	8,413	79,116	72,364
Sodium hydroxide:				
Electrolytic process				
Liquid[5]	144,380	122,334	1,286,130	1,141,429
Solid	29,318	25,098	250,422	194,719
Lime-soda process				
Liquid[5]	67,456	63,920	637,435	626,510
Solid	23,532	20,460	209,724	204,338
Sodium phosphate:				
Monobasic	1,251	1,195	8,827	11,893
Dibasic	9,259	7,134	68,997	68,347
Tribasic	6,536	7,261	58,418	65,021
Meta	2,452	2,905	25,383	22,098
Tetra	4,985	5,092	47,369	40,176
Sodium silicate, anhydrous	38,322	36,329	350,322	349,669
Sodium sulphate				
Anhydrous	15,866	10,279	137,296	114,312
Glauber's salt[6]	16,137	18,462	185,108	153,261
Salt cake[6]	60,674	51,831	539,240	497,490
Sulphuric acid[6,7]				
Chamber process	286,174	273,161	2,477,511	2,756,995
Contact process, new	644,047	571,072	6,025,050	5,539,430

Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. Where no figures are given data are either confidential or not yet available. [1]Includes a small amount of aqua ammonia. [2]Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodium bicarbonate, and quantities processed to finished light and finished dense. [3]Not including quantities converted to finished dense. [4]Data collected in cooperation with the Bureau of Mines. [5]Figures represent total production of liquid materials, including quantities evaporated to solid caustic and reported as such. [6]Includes oleum grades, excludes spent acid. [7]Data for sulphuric acid manufactured as a byproduct of smelting operations are included.

United States Production of Certain Synthetic Organic Chemicals

October 1948, October 1947 and Ten-Month Totals for 1948 and 1949

	October 1948	October 1947	Total, Ten Months 1948	Total, Ten Months 1947
Acetic acid:				
Synthetic[1]	35,957,899	27,302,164	326,273,412	302,981,271
Recovered	160,797,000	128,520,127	1,236,838,510	1,196,899,041
Natural[2]	2,394,170	2,367,951	21,747,202	21,385,951
Acetic anhydride[3]	60,385,138	35,070,604	631,114,272	506,914,787
Acetone	29,434,752	34,340,745	298,230,901	326,413,610
Acetylsalicylic acid	1,078,570	1,002,152	7,562,170	10,330,400

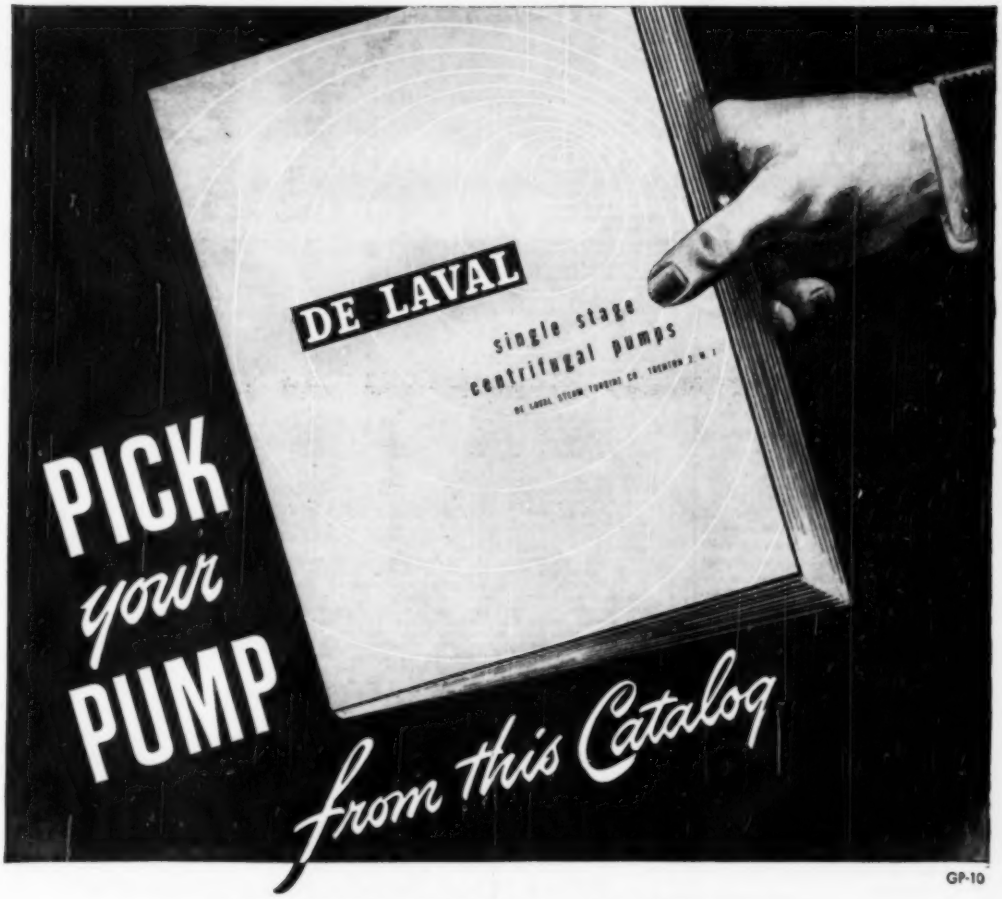
(*Continued on page 342*)

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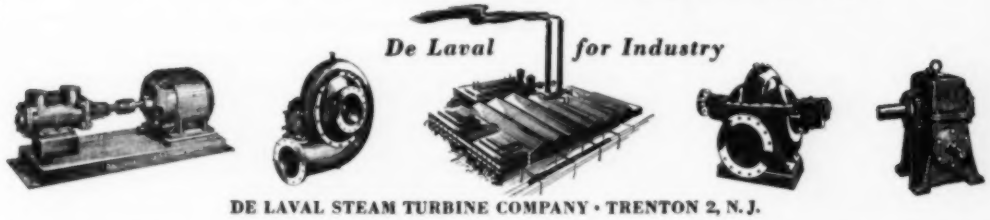
GP-10

COMPLETE WITH RATING TABLES AND DIMENSIONS

The text explains and illustrates features of design that you should look for when buying a pump. The simplified rating tables list pump and motor sizes for delivery and head requirements ranging from 150 gpm and 30′ head to 5000 gpm and 250′ head. The dimension drawings provide all information necessary for preliminary installation layouts. Ask for catalog GP-10.

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LOOK WHAT'S HAPPENING
on the Texas Coast

ALCOA PICKS TEXAS

Construction is under way for the $10 million first unit of Aluminum Company of America's new plant at Point Comfort near Port Lavaca, Texas. Complete project is expected to total $25 million. The new plant will be completed late in '49, and when in full production, will turn out some 75 million pounds of pig aluminum a year. Mobile and East St. Louis will furnish the bauxite; Texas natural gas will furnish the fuel for Alcoa's high-temperature conversion process.

☆ ☆ ☆

DUPONT HEADS SOUTHWESTWARD AGAIN

The du Pont Company of Wilmington, Delaware, is working on plans for their new multi-million dollar plant to be built on a 1700-acre site near Victoria, in the Guadalupe River Valley of Texas. New plant will produce chemicals and will ship them to other du Pont subsidiaries in Texas and on the East Coast.

☆ ☆ ☆

TALL TALE - BUT TRUE

In 1936 a hunter on the million-acre King Ranch parked his car while hunting white-wing doves. As he walked away, he neglected to take bearings. Later, he couldn't find his car. For a week, searchers beat the mesquite looking for the lost car. Payoff came last November when workers clearing the land found the car exactly where it had been left 12 years before. The radio was still usable.

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HOUSTON PIPE LINE CO.
Subsidiary of Houston Oil Company of Texas
Wholesalers of Natural GAS

U. S. Production of Synthetic Organic Chemicals (Cont. from page 340)

	October 1948	October 1947	Total, Ten Months 1948	Total, Ten Months 1947
Aniline	7,242,613	10,113,469	80,367,312	88,928,85[5]
5-Ethyl-5-phenylbarbituric acid and salts (phenobarbital)	35,280	56,791	298,716	394,208
Benzene:				
Motor grade:				
Coke-oven operators[6]	694,277	1,103,515	7,030,623	13,883,701
All other grades:				
Tar distillers[6]	1,000,907	1,521,110	27,188,712	17,916,788
Coke-oven operators[6]	13,299,171	12,561,363	121,522,312	116,942,011
Butyl alcohol, primary, normal	14,483,925	10,347,112	111,396,336	118,004,250
Carbon bisulphide	35,926,315	30,492,113	304,600,838	280,546,189
Carbon tetrachloride	19,298,357	14,919,436	173,827,898	163,137,907
Chlorobenzene, mono	27,134,884	27,442,195	241,499,981	270,166,267
Creosote oil:				
Tar distillers[6]	9,194,179	10,599,403	90,402,546	
Coke-oven operators[6]	2,562,096	3,309,439	29,179,262	32,807,410
Cresols, meta-para	791,594	541,853	7,559,580	5,168,123
Cresols, ortho-meta-para[7]	1,011,150	628,046	7,922,680	7,533,228
Cresylic acid, refined[8]	1,599,421	2,403,254	22,599,879	21,796,165
Dibutyl phthalate	1,546,424	1,721,008	13,119,130	17,426,623
Dichlorodiphenyltrichlorethane (DDT)	1,102,571	2,587,994	12,558,214	42,294,983
Ethyl acetate, (85%)	5,037,901	7,180,905	54,062,658	99,756,205
Ethyleneglycol	33,627,749	21,732,477	295,494,968	179,622,568
Ethyl ether	3,388,089	3,472,941	29,519,041	34,212,999
Formaldehyde, (37%)	57,323,108	40,516,943	523,113,916	430,326,694
Hexachlorocyclohexane	1,447,378	1,052,635	13,553,394	5,016,238
Methanol, natural[9]	1,232,696	1,502,539	13,403,808	13,453,756
Methanol, synthetic	108,872,705	46,910,007	821,981,135	448,340,452
Naphthalene:				
Tar distillers, less than 79° C	20,546,830	18,296,820	175,352,241	187,441,858
Tar distillers, 79° C. and over	7,625,867	7,009,722	81,548,130	81,996,594
Coke-oven operators, less than 79° C	9,263,026	7,942,663	83,306,728	78,775,399
Penicillin and salts[9]	8,620,538	4,745,212	77,630,179	30,639,597
Phenol	27,535,960	24,994,170	239,076,402	219,490,451
Phthalic anhydride	13,977,414	12,529,030	125,561,328	115,715,591
Styrene, government and private plants	32,075,908	25,982,826	311,083,261	251,262,143
Toluene:				
Coke-oven operators	2,423,859	2,568,473	23,549,142	22,241,814
All other[9]	3,618,359	4,447,619		29,169,770
Xylene, crude	5,430,416	2,856,642	50,341,657	34,119,759

All data in pounds except benzene (gal.) creosote oil (gal.), toluene (gal.) xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. [1]Excludes the statistics on recovered acid. [2]Acid produced by direct process from wood and from calcium acetate. [3]All acetic anhydride including that from acetic by vapor-phase process. [4]Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. [5]Statistics are given in terms of bulk medicinals only. [6]Statistics collected by Bureau of Mines. [7]Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. [8]Reported to U. S. Bureau of the Census. [9]Includes toluene produced from petroleum by any process. [10]Includes refined cresylic acid from petroleum.

DIRECTORY OF WESTERN CHEMICAL PRODUCERS

Listing Prime Manufacturers of Chemicals in the West, By Name and Location

This directory, compiled almost altogether through personal contact by the Western editors of Chemical Engineering, meets the needs of Western Chemical Producing and Consuming Industries for a dependable and usable Directory. It's their buying guide.

This Directory of Western Chemical Producers tells you: —

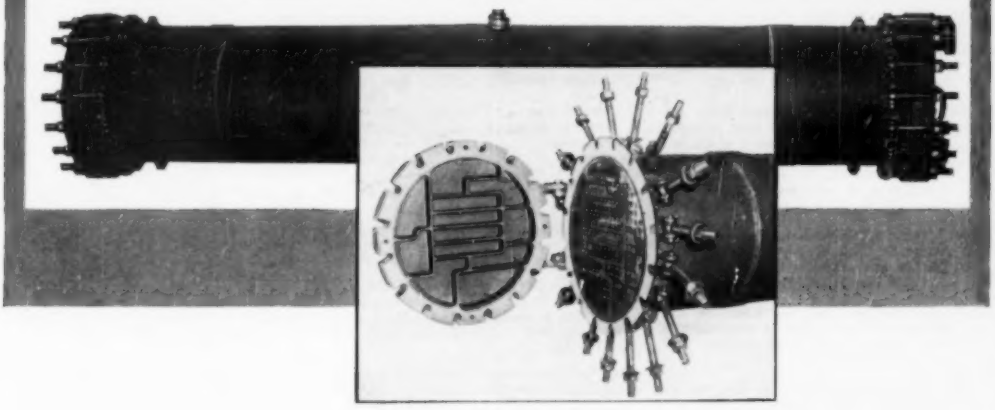
1. **How many *chemicals* are made in the West**
2. **How many *plants* there are**
3. **How many *employees* are needed**
4. **Where the *major centers of chemical activity* in the West are**
5. **Where *other Western chemical* plants are located**

Chemical users will want to write today for this handy directory. Priced at $1.00, it offers you an up-to-date listing of those Western chemical manufacturers ready to serve you.

Write to EDITORIAL Dept.,

CHEMICAL ENGINEERING
330 West 42nd Street
New York 18, New York

This VEGETABLE OIL COOLER *fabricated by* DOWNINGTOWN



has a cooling load of 8 tons refrigeration

The above pictured unit was *considered* and *approved* by the New York State Sanitary Department (with its rather strict requirements). It is now cooling 10 GPM of vegetable oil from 90° F. to 50° F. by means of Freon-12 boiling in the shell at a temperature of 40° F; this is a cooling load of 8 tons refrigeration. Heads are swing-bolted for quick clean-out of tubes from either end. Tubes are ¾" diameter, steel.

We of DOWNINGTOWN are well prepared to design and build coolers of this nature . . . for other oils and other liquids, such as fruit juices, soups, extracts, etc. We will also build these coolers of Stainless Steel if the customer so desires. At present, our deliveries are good.

DOWNINGTOWN coolers use either Ammonia or Freon-12, in the shell, to cool vegetable oil in the tubes. The tube side is usually carbon steel, with ordinary tubes being utilized. Head construction varies in accordance with local Sanitary Departments requirements.

DOWNINGTOWN will fabricate these units to A.S.M.E. code, or to any other reasonable standards that may be required.

Our Engineering Consultation is *at your service* to aid you in preparation of plans and specifications for definite jobs.

DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
HEAT EXCHANGERS

NEW CONSTRUCTION

Proposed Work

Ca., Douglas—Filtered Rosin Products, Inc., c/o John Laws, plans to construct a naval stores plant. Estimated cost $75,000.

La., Bogalusa—Gaylord Container Corp. will rebuild its No. 4 machine here, including additions and new equipment, which will increase daily production from 90 to 170 tons of semi-chemical pulp used in the manufacture of corrugated boxes. B. B. Pierce, Ch. Engr. Estimated cost $1,000,000.

N. J., Raritan Twp.—Johnson & Johnson, 500 George St., New Brunswick, plan the construction of a warehouse and office building. Estimated cost $1,185,000.

N. J., Westville—Texas Co., River Ave. and Pennsylvania R. R., plans to construct additional refinery and storage facilties. Estimated cost $50,000,000.

N. Y., Niagara Falls—E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., plans to construct a plant here for the manufacture of polyvinyl alcohols. Estimated cost $3,000,000.

O., Ashtabula—National Distillers Products Corp., 120 Bway., New York, N. Y., plans to construct a plant to manufacture metallic sodium and chlorine. Estimated cost $10,000,000.

Pa., Marcus Hook—Sun Oil Co., 1620 Walnut St., Philadelphia, plans to construct additions to its refinery and storage facilities. Estimated cost $20,000,000.

Pa., Philadelphia—Atlantic Refining Co., Atlantic Refining Bldg., plans to construct additional refinery and storage additions. Estimated cost $20,000,000.

Pa., Philadelphia—Gulf Refining Co., Gulf Bldg., plans to construct additional refinery and storage additions. Estimated cost $40,000,000.

Pa., Philadelphia—Sinclair Refining Co., 58th St. and Schuylkill River, plans to construct additional refinery and storage additions. Estimated cost $15,000,000.

Tex., Andrews—Phillips Petroleum Co. and Fullerton Oil Co., Andrews and Bartlesville, Okla., plans to construct second plant for the manufacture of flare gas. Estimated cost $2,225,000.

Tex., Grapeland—Geier-Jackson, Inc., Grapeland, plans to double the capacity of its existing cycling-natural gasoline refining plant. Estimated cost $350,000.

Tex., Houston—American Can Co., Lockwood and Clinton Dr., plans to construct a paper milk container addition to its plant. Estimated cost $375,000.

Tex., Jonesville—Byrd Oil Corp., Tower Petroleum Bldg., Dallas, and Ed. Hurley, Atlas Bldg., Shreveport, La., plans to construct a dehydration gas plant to have a daily capacity of 20,000,000 cu. ft. Estimated cost $750,000.

	Current Projects		Cumulative 1949	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	.....	.....
Middle Atlantic	$149,185,000	$838,000	$149,745,000	$1,842,000
South	1,075,000	1,250,000	1,243,000	1,100,000
Middle West	10,068,000	68,000	10,068,000	272,000
West of Mississippi	22,200,000	2,508,000	24,075,000	890,000
Far West	.....	80,000	1,000,000	.....
Canada	11,365,000	.....	13,440,000	5,600,000
Total	$193,893,000	$4,744,000	$199,571,000	$9,704,000

Tex., Port Arthur—Gulf Oil Corp., Port Arthur, plans to construct 3 atmospheric vacuum topping stills. Estimated cost $8,000,000.

Tex., Port Arthur—Gulf Oil Corp., Port Arthur, plans to construct a Polyform refinery unit, also a desulphurization refinery unit. Estimated cost $4,500,000 and $6,000,000 respectively.

Wis., Sheboygan—Eagle Insulation & Refining Co., 1109 North 8th St., plans to construct a 1 story, 90x256 ft. warehouse. W. C. Weeks, Inc., 720 Ontario Ave., Archt.

Alta., Edmonton—McColl-Frontenac Oil Co., 360 St. James St., W., Montreal, Que., plans to construct an oil refinery on the outskirts of the city. Estimated cost $10,000,000.

Alta., Red Deer—Alberta Pulp Mills, Ltd., Red Deer, plans to construct a new plant for the manufacture of pulp, newsprint and fine paper. Estimated cost will exceed $250,000.

Ont., Hamilton—John Dickinson Co., Ltd., Apsley Mills, Hampstead, England, plans to construct an addition to its wax paper manufacturing plant here. Estimated cost $70,000.

Ont., Toronto—National Vulcanized Fibre, Wilmington, Del., and 107 Atlantic Ave., plans to construct a plant here for the manufacture of phenolite laminated plastics. Estimated cost $70,000.

Que., Danville—International Asbestos Co., Ltd., c/o J. O. C. Belisle, Sherbrooke, plans to construct a 25 ton pilot mill. Estimated cost $75,000.

Que., Montreal East—Standard Chemicals, Ltd., 5070 St. Ambroise St., Montreal, plans to construct a plant for the manufacture of ethylene glycol antifreeze. Estimated cost $150,000.

Que., St. Adrien de Ham—International Asbestos Co., Ltd., 66 Wellington St., plans asbestos field development and 1,000 ton mill.

Que., Sherbrooke—Quebec Rayon Mills, Ltd., 93 Frontenac St., Sherbrooke, plans to construct an addition to its plant. Estimated cost $250,000.

Contracts Awarded

Ky., Junction City—Kreamer Veneer Plant, Junction City, will construct a new veneer plant to replace Burnside Veneer Plant at Burnside, Ky. Work will be done by separate contracts. Estimated cost $500,000.

N. Y., Rochester—Eastman Kodak Co., Kodak Park, will construct a 3 story addition to Bldg. No. 28. Work will be done with own forces. Estimated cost $628,000.

O., Sandusky—Cellulo Co., Sandusky, has awarded the contract for a 1 story, 50x100 ft. addition to its plant to E. Feick & Co.

Pa., Marcus Hook—General Chemical Co., 1100 Line St., Camden, N. J., has awarded the contract for alterations to its rotary cooler plant and sulphate plant to J. A. Bader & Co., Inc., 923 Market St., Wilmington, Del. Estimated cost $70,000 each.

Pa., Philadelphia—Wissahickon Asbestos Co., Ambler, will construct an addition to its factory. Work will be done by separate contracts. Estimated cost $70,000.

Tenn., Columbia—Monsanto Chemical Co., Columbia, has awarded the contract for the construction of a smoke washing unit to Rust Engineering Co., Clark Bldg., Pittsburgh, Pa. Estimated cost $750,000.

Tex., Bishop—Rosewood Refinery Co., Bishop, will construct a refinery unit. Work will be done by purchase and hire. Estimated cost $70,000.

Tex., Dallas—Thompson-Hayward Chemical Co., c/o Vilbig Bros., contractor, 2026 Singleton Blvd., will construct an agricultural and industrial chemical warehouse. Estimated cost $145,000.

Tex., Houston—Goodyear Synthetic Rubber Co., LaPorte Rd., has awarded the contract for an addition to its plant for the manufacture of "cold rubber" to Consolidated Western Contractors, Inc., M & M Bldg., Houston. Estimated cost $500,000.

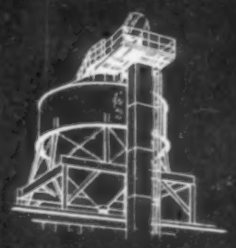
Tex., Houston—Humble Oil & Refining Co., Humble Bldg., has awarded the contract for a warehouse, bulk station and shop, etc., to Texas Gulf Construction Co., 2008 South Wayside St. Estimated cost $318,000.

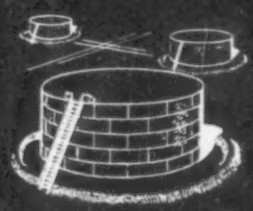
Tex., Mineral Wells—Brazos River Gas Co., Mineral Wells, will construct an absorption plant to process natural gas. Work will be done by owners. Estimated cost $475,000.

Tex., Wichita Falls—Panhandle Producing & Refining Co., Panhandle Bldg., will enlarge its refinery cracking plant. Work will be done by owners. Estimated cost $1,000,000.

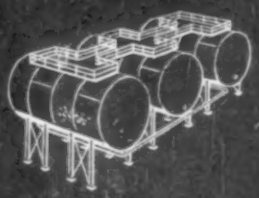
Utah, Salt Lake City—Goodyear Tire & Rubber Co., Inc., 960 South Main St., has awarded the contract for constructing a warehouse and office building to Ellis Barker Co., Ness Bldg. Estimated cost $80,000.

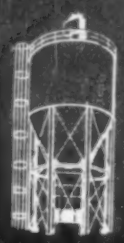












How to Solve

YOUR MATERIALS STORAGE PROBLEM!



PITTSBURGH · DES MOINES Research

develop the answers for you

Finding the *right answers* to questions of efficient materials storage is a primary Pittsburgh-Des Moines activity.

Our research engineers, and our Chemical Storage Fellowship at Mellon Institute for Industrial Research, conduct a continuous program of study on storage problems from many fields, which is translated into better design, materials and methods by our fabricating divisions for the customer's benefit.

We will be glad to help with your own storage problem, if you will send us an outline of the factors involved.

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These LIFE TESTS *prove:*

THE VALUE OF MONEL-CLAD STEEL HERE

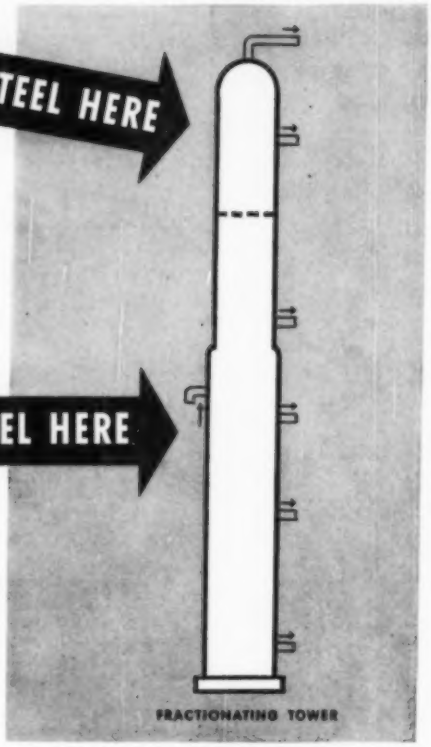
PLANT CORROSION TESTS* IN TOP OF CRUDE TOPPING TOWER	
Material	**Corrosion rate, inch penetration per year**
Monel	0.003
Nickel	0.006†
Inconel	0.017†
18-8 Mo stainless steel (type 316)	0.053†
18-8 stainless steel (type 304)	Completely corroded away

*In straight run gasoline vapor in top of tower. Average temperature 250° F. Duration of test, 60 days. West Texas crude.
†These materials suffered pitting attack.

AND OF STAINLESS-CLAD STEEL HERE

PLANT CORROSION TESTS* IN BOTTOM OF CRUDE TOPPING TOWER	
Material	**Corrosion rate, inch penetration per year**
Monel	0.17
Nickel	Completely corroded away
Inconel	0.0002
18-8 Mo stainless steel (type 316)	Less than 0.0001
13 percent Cr steel (type 410)	0.0014

*At bottom of crude fractionating tower, approximately 5' above tray No. 38 near the overflow side. Average temperature 700° F. Duration of test 120 days. East Texas crude. 88 gal. per hr. Na_2CO_3 injected into crude feed.



Consider, first, the materials promising long life on your equipment; tests like these tell you that. Then weigh comparative cost figures, fabricating characteristics and any other factors involved. You find a safe and economical answer—the Lukens Clad Steel best meeting your requirements.

Life of equipment is lengthened many times, reducing depreciation to a fraction. Maintenance costs are held to a minimum. Equipment is kept in service without interruption. Safe operation is assured. Think what all these advantages add up to!

Lukens makes the most complete range of clad steels available from any source: Nickel-Clad, Stainless-Clad, Inconel-Clad and Monel-Clad Steels, in plates as wide as 178 inches or to over 3 inches thick. Each has a uniform cladding of the corrosion-resistant metal permanently bonded to the steel backing plate. All are available in the extra-smooth sodium hydride finish.

Bulletins 255 and 338 describe these Lukens Clad Steels. For copies, write Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

LUKENS

Nickel-Clad Stainless-Clad
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STEELS

★

Two 16mm Kodachrome motion pictures—"The Manufacture of Lukens Clad Steels" (silent) and "Solving Corrosion Problems" (with sound)—will be loaned to you. Write for booking date.

SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

INERTS . . . 24 HOURS A DAY

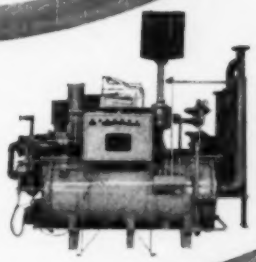
Whatever your needs . . . purging, flushing, blanketing, agitating, controlling . . . you can make your own inert gases in your own plant 24 hours a day.

• And the cost to you, compared with all that goes with outside bottled gas cylinder handling, is *really low*—from 10¢ per Mcf for unprocessed inerts up to 18¢ per Mcf for compressed nitrogen.

• Cheaply and conveniently, you can produce inert gases 24 hours a day, if your processing demands it, with Kemp Inert-Gas generating systems . . . completely automatic, permanent, and virtually free of maintenance for years of dependable service.

• You can learn more about Kemp Inert-Gas Producers by talking to our representative...or write for the NEW Bulletin No. I-10 for the story.

Model 5 MIHE
Capacity 5000 CFH Inert gas at 15 inch water column discharge pressure. →





The C. M. Kemp Manufacturing Co.
405 East Oliver Street, Baltimore 2, Maryland

☐ Please send a Kemp representative in to see me.
☐ Please send me your NEW Bulletin No. I-10 on Inert Gases.

Name .....
Company .....
Street .....
City ..... Zone ..... State .....

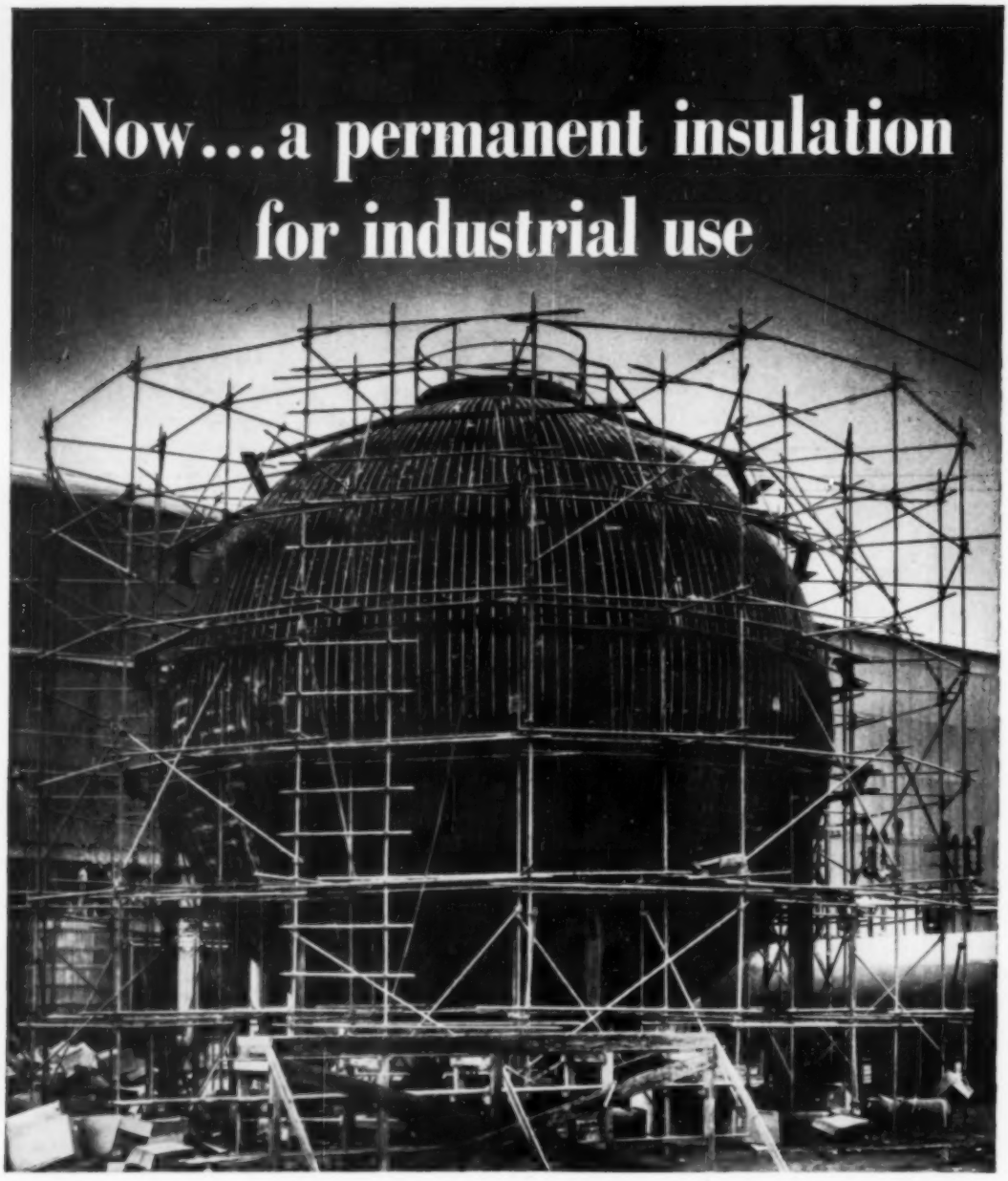
MOE-2

KEMP of BALTIMORE

PRECISION CARBURETORS • BURNERS FOR INDUSTRIAL HEAT CONTROL • FIRE-CHECKS AND OTHER SAFETY DEVICES

ATMOSPHERE GENERATORS • INERT GAS PRODUCERS • ADSORPTIVE DRYER SYSTEMS FOR PROCESS CONTROL

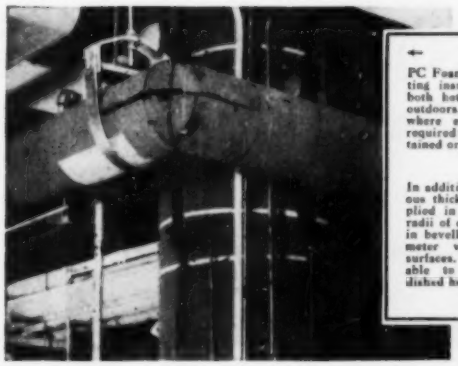
Now... a permanent insulation for industrial use



Insulating this spherical tank, used for storing liquid ammonia at 20° F., presented many unusual problems. These were met successfully by PC Foamglas—the only material of its kind—composed of millions of tiny glass cells filled with sealed-in air, which is waterproof, fireproof and vaporproof, and which keeps its original insulating efficiency *permanently*.

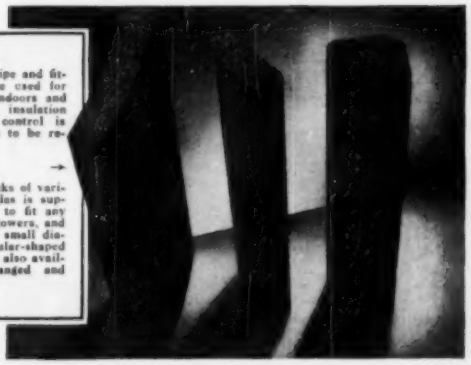
PITTSBURGH PC CORNING

FOAMGLAS INSULATION



PC Foamglas is the only pipe and fitting insulation that can be used for both hot and cold lines—indoors and outdoors. It's the ideal insulation where exact temperature control is required; wherever heat is to be retained or excluded.

In addition to standard blocks of various thicknesses, PC Foamglas is supplied in preformed shapes to fit any radii of circular tanks and towers, and in bevelled lags for domes, small diameter vessels and irregular-shaped surfaces. Shaped material is also available to fit spherical, flanged and dished heads.



PC FOAMGLAS . . . for hot and cold applications . . . for indoor and outdoor use

IT'S WEATHERPROOF, FIREPROOF, WATERPROOF, VAPORPROOF

● On process equipment and piping, PC Foamglas withstands humidity; helps maintain desired temperature levels; aids in minimizing condensation. And, since PC Foamglas is a true glass . . . not a fiber, wool, board or batt . . . it is waterproof, fireproof and verminproof—proof against the elements that cause other materials to deteriorate. It's a fact that when PC Foamglas is installed according to our specifications for recommended applications, it retains its original insulating efficiency *permanently*.

PC Foamglas requires no protective covering, either. There aren't the costly repairs, replacements and maintenance involved in other insulating materials.

What's equally important, PC Foamglas is light weight; easy to handle. It can readily be cut with a knife in straight lines or odd shapes. And because it's friable, when subjected to point loading, it yields to such surface irregularities as rivet heads and welds. Thus it can be pressed close to the area to be insulated without breaking or cracking; it can be shaped to curved surfaces of all radii.

Remember, first cost is last cost when you insulate tanks, towers, heat exchangers and other processing equipment with permanent PC Foamglas. But why not get full and up-to-date information? Fill in and return the coupon for our free booklet. There's no obligation.

This is FOAMGLAS

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, water, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain inert air, lies the secret of the material's permanent insulating efficiency.

FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS

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Without obligation on my part, please send me your FREE booklet on PC Foamglas Insulation, the *permanent* industrial insulation.

Name.....

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When you insulate with Foamglas ...you insulate for good!



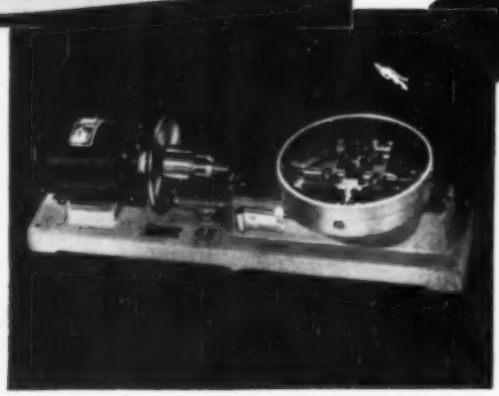
Cut Analytical Costs *TWO WAYS* with . . .

1. TIME-SAVING SPECTRUM PLATE PROJECTOR and CHARTS



● For ease of operation—speed, convenience and greater accuracy in examination of spectrum plates—for line identification, measuring wave lengths and preparing for densitometry, there is no instrument like the B&L Spectrum Projector. Here is a projector that delivers a clear, sharp, magnified image of the spectrum . . . one that can be easily compared to the B&L iron arc spectrum charts. These charts are supplied as optional equipment.

2. HIGH-SPEED ELECTRODE SHAPER

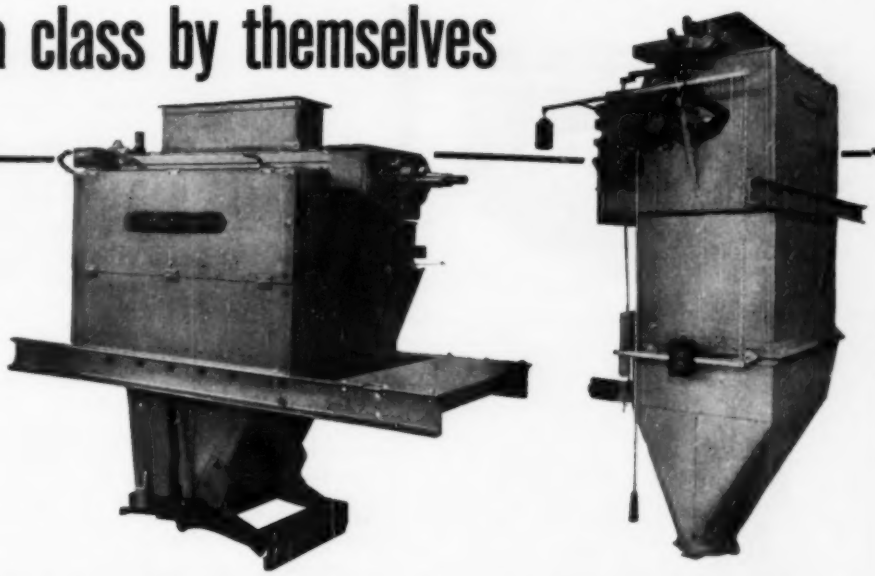


● Now you can turn the ends of graphite electrodes *to any desired form* much faster and easier with a B&L Electrode Shaper. This small "turret lathe" is simple to operate. Simply adjust for the desired cutting tool combination, insert the graphite rod, and move turret into shaping position. Motor starts and stops automatically. *Any four* cutting tool set-ups can be maintained at *one time.*

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Bausch & Lomb *Spectrographic* Accessories

In a class by themselves



For accurate weighing, porportioning and bagging

New RICHARDSON automatic Bulk weighing scale—class 38

Gives you continuous accurate weights when handling borax, ores, clays, minerals, salts, soda ash, potash, alum, etc.—and you get the savings that go with Richardson accurate control due to the equal-arm lever principle—the most accurate method of weighing known. For batch mixes you can get desired proportions with a battery of these scales.

With this totally enclosed scale—dustproof, and easy to operate—weighing chemicals to mixers, grinders, mills, storage bins, packers, driers, etc., your control of plant operations—by weight—is complete. In addition, automatic counter provides continuous operation records for determining what each pound of chemical processed is costing you. Write for Bulletin No. 8946.

New RICHARDSON automatic Bagging scale—model G-38

For weighing and bagging dry, ground, and granular chemicals and minerals, you can depend on this Richardson Scale for continuous accuracy and economy.

Among the many reasons why the new Richardson Model G-38 is finding favor with chemical industries are these *construction features.*

Brush-sealing, radial feed gate closes when weighed material is in true balance. Automatic discharge from scale hopper to bag (or manual control, if desired). Scale is made in special alloy metals and modified design for corrosive or abrasive materials.

Get the whole story of the Model G-38—its accuracy, economy and all 'round dependability. Write for Bulletin No. 9646.

MATERIALS HANDLING BY WEIGHT

TYPE OF GROUND, DRY OR GRANULAR MATERIALS

Alum • Borax • Lime • Calcium Chloride • Graphite • Carbon Black
Feldspar • Nitrates • Clays • Ores • Talc • Salt • Fullers' Earth
Potash • Sludge • Soda Ash • Phosphates

Handled by RICHARDSON SCALES

RICHARDSON SCALE COMPANY
CLIFTON, N. J.

Atlanta • Boston • Buffalo
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1. Is this an au-to-mo-bile?
Yes, this is an au-to-mo-bile.
It is a fine au-to-mo-bile and

POWELL VALVES

helped to make every part of it.

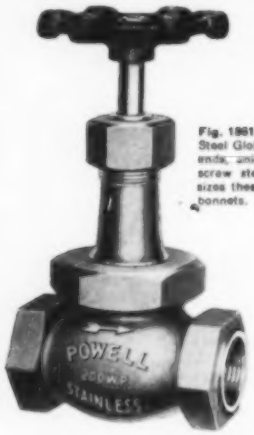


Fig. 1861—200-pound Stainless Steel Globe Valve with screwed ends, union bonnet and inside screw stem. In 2½" and 3" sizes these valves have bolted bonnets.

American Industry has gone a long way since McGuffey compiled his First Reader in 1836. But Powell Valves have matched every step in its progress.

Literally, Powell Valves help to make everything that goes into the modern automobile. Because, whether it be motor, transmission, chassis, body, plastics, finishes, tires, anti-freeze, battery, gasoline or any other processed item, there are Powell Valves exactly suited to control the flow of all media used in their production.

This automobile merely illustrates the completeness of the Powell Line. The important point is that, no matter what *your* product may be, there are Powell Valves especially adapted for each and every one of your flow control services.

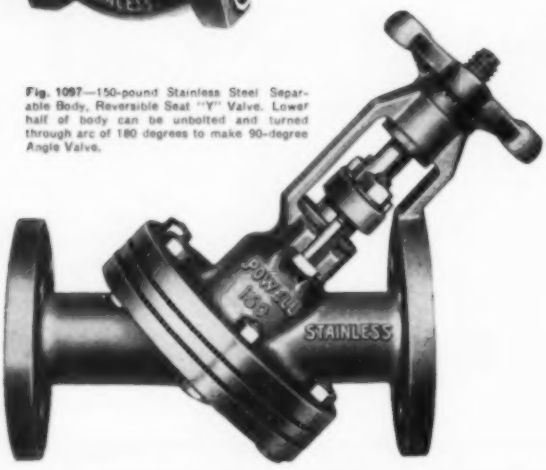


Fig. 1097—150-pound Stainless Steel Separable Body, Reversible Seat "Y" Valve. Lower half of body can be unbolted and turned through arc of 180 degrees to make 90-degree Angle Valve.

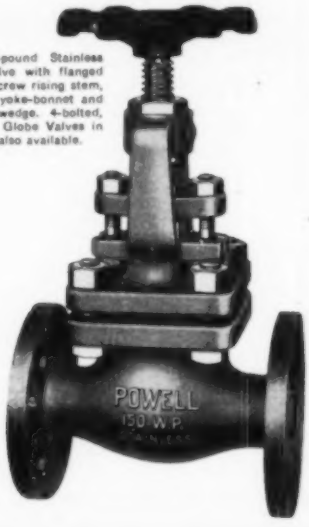


Fig. 1960—150-pound Stainless Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke-bonnet and tapered solid wedge. 4-bolted, flanged bonnet Globe Valves in this design are also available.

POWELL



Fig. 2433—150-pound Stainless Steel Swing Check Valve with flanged ends and bolted flanged cap.

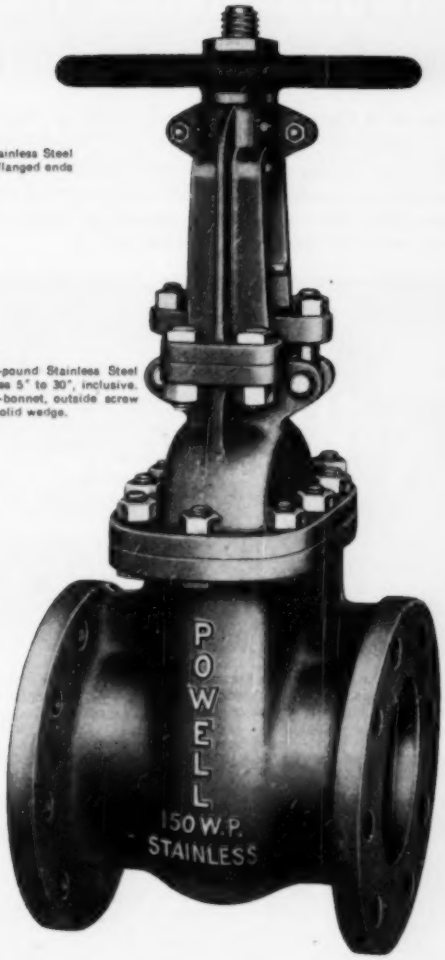


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve. Made in sizes 5" to 30", inclusive. Has bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge.



Flush Bottom Tank Valve. Made with disc rising into tank to open valve (**Fig. 2309**) and with disc lowering into valve (**Fig. 2310**).

The Wm. Powell Company
Cincinnati 22, Ohio

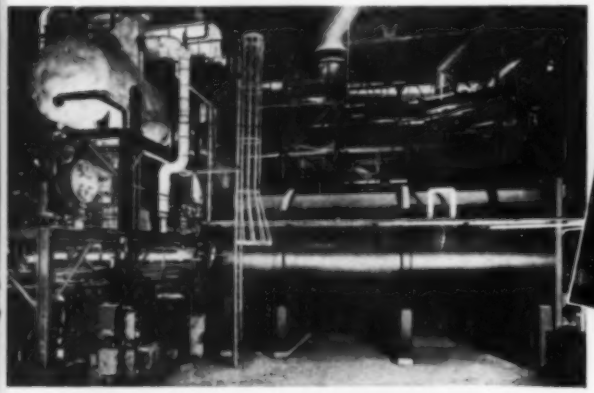
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VALVES

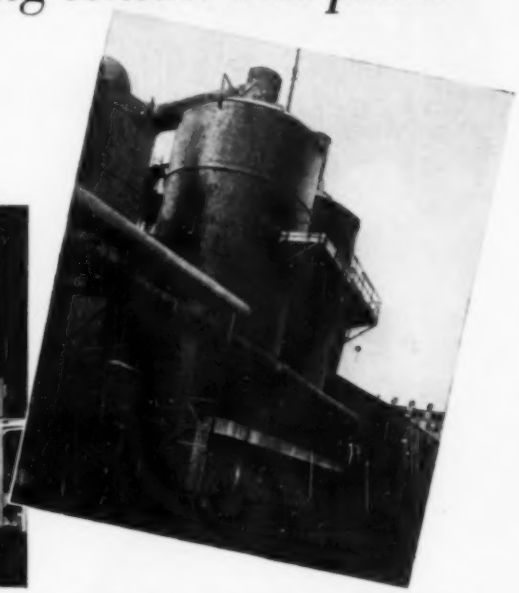
World's Largest

single unit sulfur burning contact acid plant

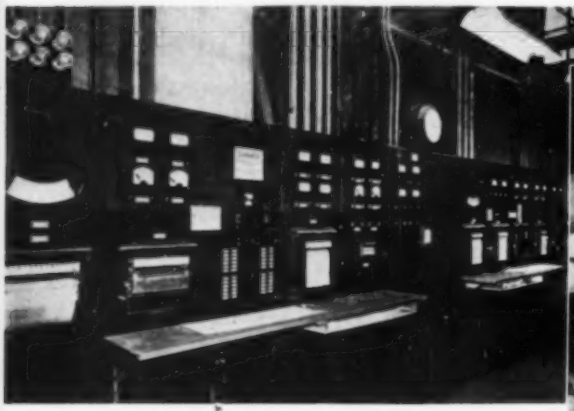
This sixth Chemico Contact Sulfuric Acid Plant for Standard Wholesale Acid and Phosphate Works in Baltimore, Md. was successfully placed in operation in December, 1948 and is regularly operating above guaranteed capacity of 500 tons per day. (100% equivalent H_2SO_4).



▲ At the right is the Sulfur Furnace with the waste heat boiler, condenser and auxiliary apparatus at the left. This furnace burns over 170 tons of sulfur a day.

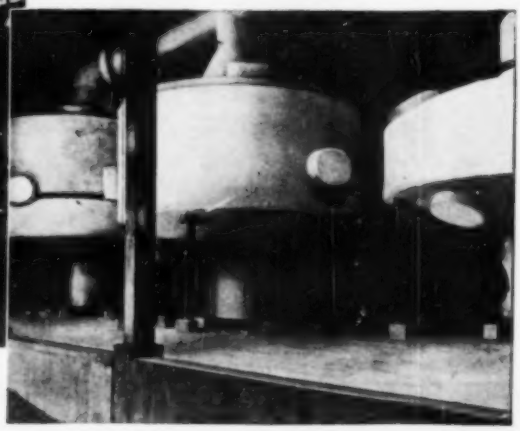


▲ Towers for the production of oleum, 98% acid and for the drying of combustion air. These are part of the drying and absorption system.



▲ Here are control panels for two of the six Chemico Contact Acid Plants. The new 500-ton plant panel is on the right.

▼ Shown left to right are the secondary converter, the primary converter and the gas filter.



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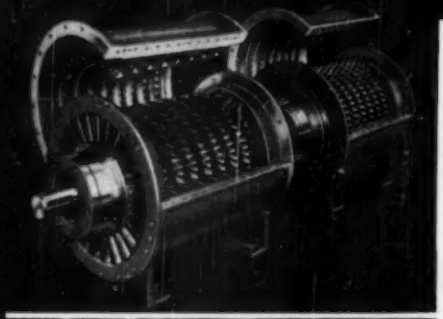
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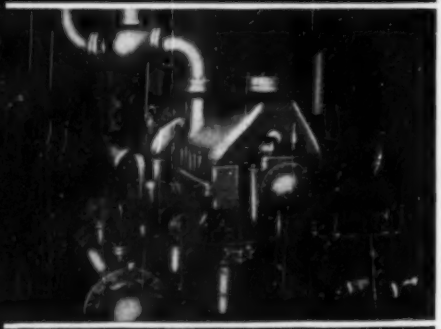
CHEMICO

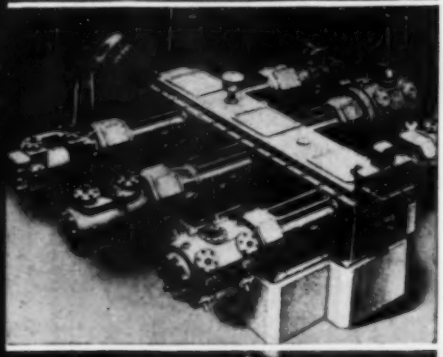
Chemico Plants are profitable investments

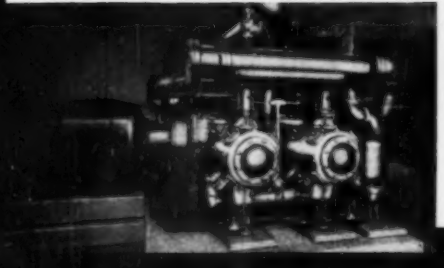
CC178

Cut Costs with these CLARK COMPRESSORS









CLARK AXIAL FLOW COMPRESSOR—Clark Axial Flow Compressors are high-capacity, high-efficiency machines, especially valuable in the volume range of 20,000 to 300,000 CFM. Adiabatic efficiencies up to, and frequently in excess of, 85 per cent are available in industrial units.

These units are suitable for either electric motor, steam turbine or gas turbine drive. Gas turbine drives, reflecting the most recent developments in design and research, are built by Clark Bros.

CLARK CENTRIFUGAL COMPRESSOR—Clark Steam-Turbine-Driven Centrifugal Compressors are designed for direct drive by steam turbines operating either non-condensing or at high vacuum. They meet power requirements up to 25,000 BHP and speeds as high as 12,000 RPM.

This compressor is also available as an electric motor-driven unit or as a gas-engine-driven unit, through a standard speed increasing gear.

ELECTRIC-DRIVEN RECIPROCATING COMPRESSOR—Compact in design, the Clark Electric-Driven Compressor requires a minimum of floor space. Smooth operation and low maintenance cost are assured by its balanced-opposed design. All component parts are so constructed as to make the unit adaptable to a wide range of services such as synthetic ammonia, ammonia refrigeration, natural gas booster plants and many others.

Clark Electric-Driven Compressors are built in three different classes:

The CMA (8" stroke—600 RPM) with 2, 4 or 6 compressor cylinders and a horsepower range from 150 to 600 BHP.
The CRA (14" stroke—300 RPM) with 2, 4 or 6 compressor cylinders and a horsepower range from 500 to 2000 BHP.
The CBA (17" stroke—300 RPM) with 4, 6 or 8 compressor cylinders and a horsepower range from 1750 to 4500 BHP.

ELECTRIC-DRIVEN SOOT BLOWER—Recent developments in soot blower equipment prove the economy of using compressed air furnished by electric-motor-driven compressors as a soot-blowing medium. The Clark CTMA-3, with an 8" stroke and operating at 600 RPM, is an ideal unit for this service, because of its high piston displacement and minimum floor space requirement.

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The Clark Soot Blower Compressor, rugged yet simple in construction, is designed for inherent running balance with trouble-free service over long periods of continuous operation.

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Company.....
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the merger of

COMBUSTION ENGINEERING COMPANY, INC.

and

THE SUPERHEATER COMPANY

under the name

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For municipalities

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Automatic gas and electric water heaters. Soil pipe.

The close association of Combustion Engineering Company, Inc. and The Superheater Company since their affiliation in 1933 has provided the opportunity for long and careful study of the advantages that might be obtained by complete merger under a single management. The fact that a major part of the activity of both companies involved the manufacture of different but related components of steam generating units prompted the taking of some steps in the direction of merger shortly after affiliation. The resulting experience led to a continuing program designed to bring about ever closer coordination of staff and operations. Thus the complete merger, which became effective on January 1, 1949, was but the final step in the unification of two organizations long experienced in working together to achieve common objectives.

The new company will continue all past activities of Combustion and Superheater, as summarized at the left, and will be able to offer the combined facilities and services of both organizations on a world-wide scale.

B-283A

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ENGINEERING—
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AMINCO—pioneer American manufacturer in the field of high pressure—has an unmatched fund of experience in the design and construction of high-pressure apparatus to meet *efficiently* and *safely*, the exacting demands of this modern technique.

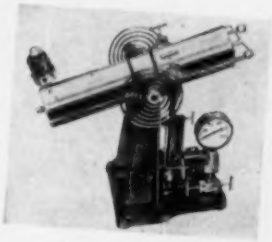
As leaders in the laboratory and semi-works high-pressure field, the Aminco organization, with its broad experience, competent engineering staff, and modern plant facilities, produces a wide range of high-pressure equipment—from components such as catalytic hydrogenation apparatus, reaction vessels, valves, fittings, tubing, instruments, pumps, compressors and other auxiliaries, to complete pilot plants for use on a laboratory or semi-works scale, for pressures up to 100,000 psi, and temperatures up to 1000° F.



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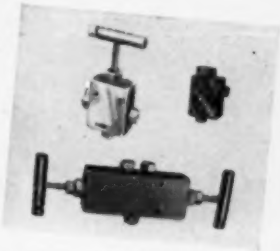
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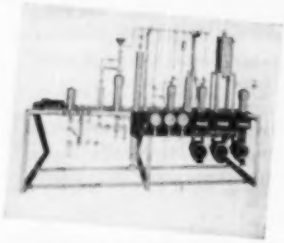
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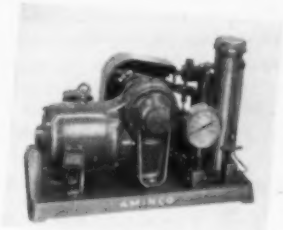
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Needle valves (straightway, angle, and cross), and combination inlet and bleeder valves, for pressures up to 100,000 psi. Check valves for pressures up to 25,000 psi. Also others.



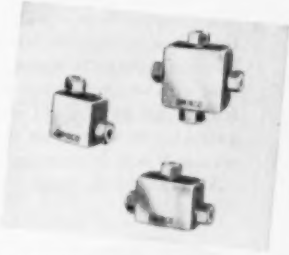
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Tubing made of stainless steel and other alloys for pressures up to 100,000 psi.

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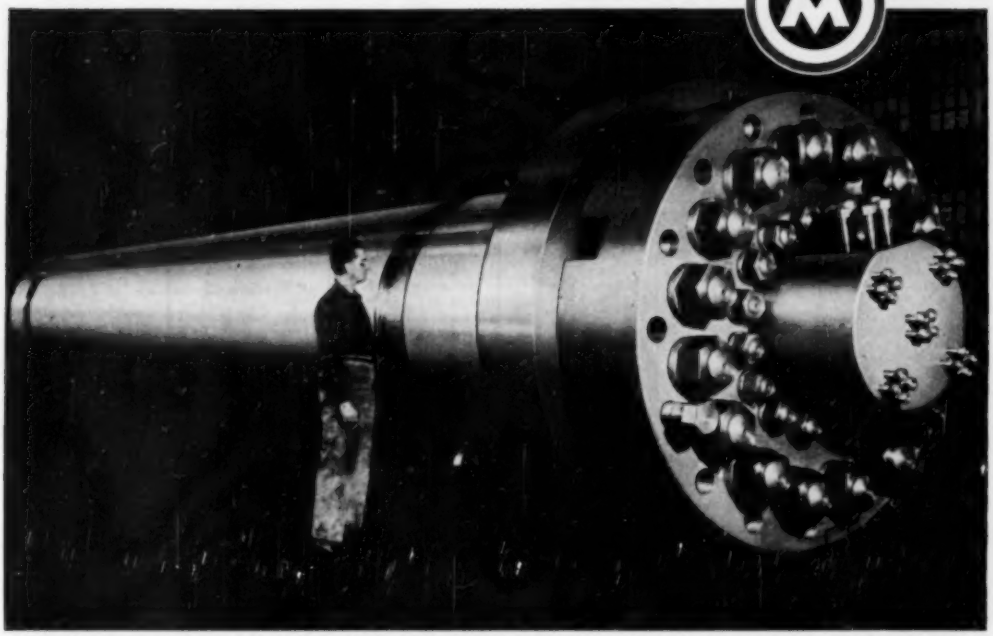
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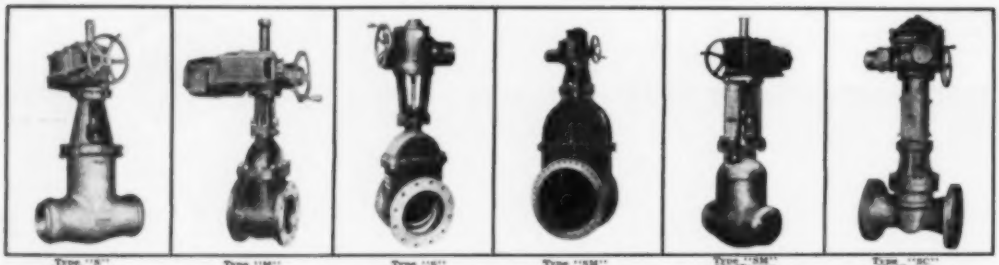
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Type "S" LimiTorque on Crane Pressure-Seal Valve

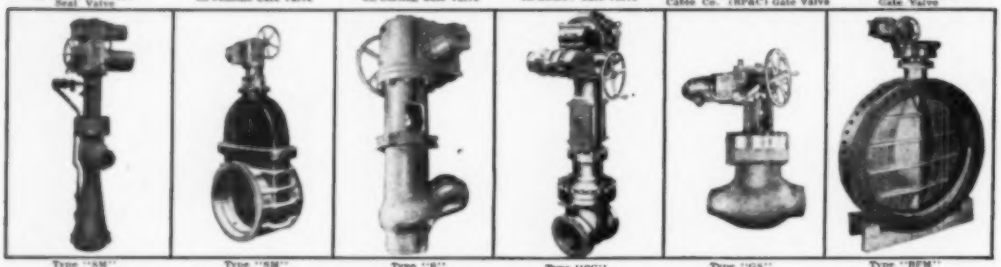
Type "M" LimiTorque on Jenkins Gate Valve

Type "G" LimiTorque on Darling Gate Valve

Type "SM" LimiTorque on Ludlow Gate Valve

Type "SM" LimiTorque on American Chain & Cable Co. (BP&C) Gate Valve

Type "SC" LimiTorque on Crane Venturi Gate Valve



Type "SM" LimiTorque on Schutte & Koerting Reducing Valve

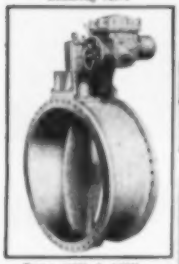
Type "SM" LimiTorque on Rensselaer Inside Screw Gate Valve

Type "G" LimiTorque on Edward Angle Valve

Type "SC" LimiTorque on Powell Gate Valve

Type "GS" LimiTorque on Edward Butler Non-Return Valve

Type "BFM" LimiTorque on Phillips (Henry Pratt Co.) Butterfly Valve



Types "S" & "M" LimiTorque on R-S Butterfly Valve (in tandem operation)



Type "SM" LimiTorque on Chapman 30" & 36" Gate Valves



Type "M" LimiTorque on 24" Iowa Gate Valve



Type "S" LimiTorque on Walworth Valve

Limitorque

MOTOR-OPERATED VALVE CONTROLS

. . . are widely used on many different makes of valves

"*LimiTorque*" operates by the "push of a button," from either remote or nearby control panel . . . prevents damage to stem, seat, disc, gate or plug, because the Torque Seating Switch limits the torque, and thereby, shuts-off the motor, *before* trouble can occur. Thousands are in daily use on land and sea.

LimiTorque Controls may be obtained through Valve Manufactures.



There's a Reason for Such Widespread Acceptance

Philadelphia Gear Works, INC.

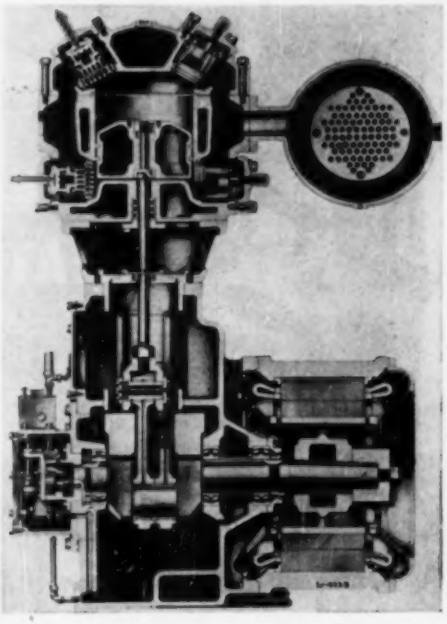


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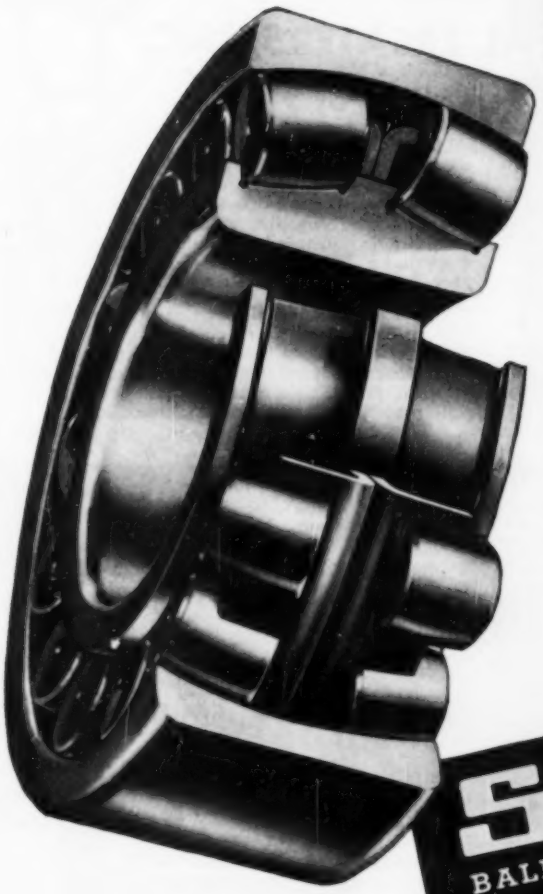
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More BEARING CAPACITY!

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● *Compressor built by Worthington Pump & Mach'y Corp.*



Compressor manufacturers learned long ago that the presence of SKF Spherical Roller Bearings means the absence of bearing adjustments at initial assembly and in the years of operation to follow. These years of long and satisfactory operation are due in part to rolling alignment that assures the availability of maximum load carrying capacity. Not only do these bearings carry crankshaft loads, but they also support the overhung armature as well. When *you* want reliability in a bearing, check the trademark. Make sure it's "SKF." 6552

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Variety of Equipment used by

SUPERIOR METAL TREATERS, INC.

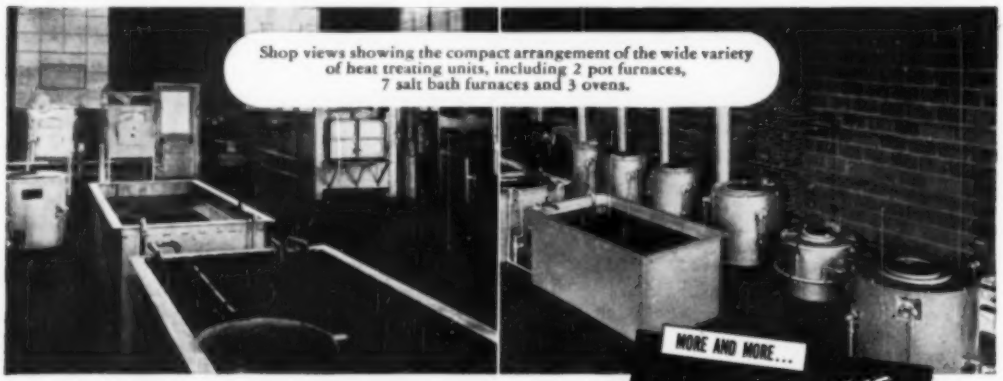
Emphasizes the Versatility of GAS

VARIETY is one of the most characteristic features of a commercial heat treating shop—variety of customer demands and variety of equipment required to fulfill them.

With a background of 22 years experience, Evan D. Ehmann, President of Superior Metal Treaters, Inc., knew just what to look for when he established his Newark, New Jersey, shop. This modern plant has the productive capacity to cope with the miscellaneous requirements of many customers.

Key feature of the installation is the versatility of the equipment. Each unit was chosen for its ability to perform under a number of different conditions. In selecting this equipment Mr. Ehmann determined to use GAS because, as he expresses it, **"During my years in this business I discovered that Gas Equipment provided the accurate control, economical operation, and versatility we needed. The precise temperatures and speed of heating we obtain with GAS mean a lot of extra production in our shop."**

Whether the heat treating process is a production-line application, or a commercial shop operation, the flexibility of GAS and the versatility of modern Gas Equipment are important economic factors. The characteristics of GAS make it stand out in any comparison with other available fuels for heat processing.



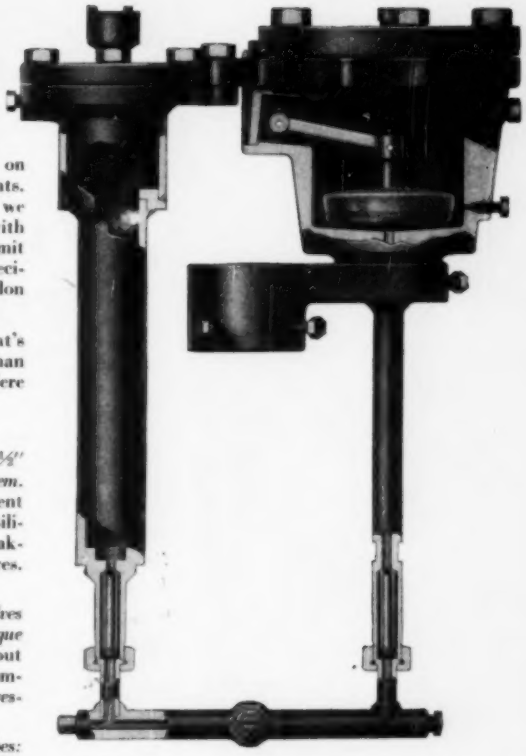
Shop views showing the compact arrangement of the wide variety of heat treating units, including 2 pot furnaces, 7 salt bath furnaces and 3 ovens.

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RESULT—we now offer you a Mercury Manometer that's ready to step in wherever you need something *better* than present differential pressure measuring instruments. Here are a few features:

1. HIGH ACCURACY. Inherent straight-line calibration.

2. POSITIVE ACTUATION—High energy output. (a) *Big 3½" float.* (b) *Long float travel—1".* (c) *Simple lever system.* (d) *Teflon in pressure-tight bearing surfaces* for efficient use of power. Teflon bearings, micro-finished shaft, silicone lubricant give unprecedented performance—leakless, with negligible friction under high working pressures. (e) *Jewelled thrust bearing.*

3. DEPENDABLE PERFORMANCE. (a) *Submerged check valves* give positive shut-off in event of overrange. (b) *Unique damping valve* adjustable under full pressure without leakage. (c) *Ample room* in mercury chambers to accommodate surges or pulsating flows. (d) *Teflon holds pressure,* yet lets shaft turn freely, giving long service.

4. GREAT ADAPTABILITY. (a) *Six interchangeable range tubes:* 10", 20", 50", 100", 200" and 400" of water. (b) *Tubes easily changed* in field without piping alterations. (c) Both side and top pressure connections. (d) *Two Manometers* can be mounted on back of single case for recording two Flows or for Ratio-Flow control.

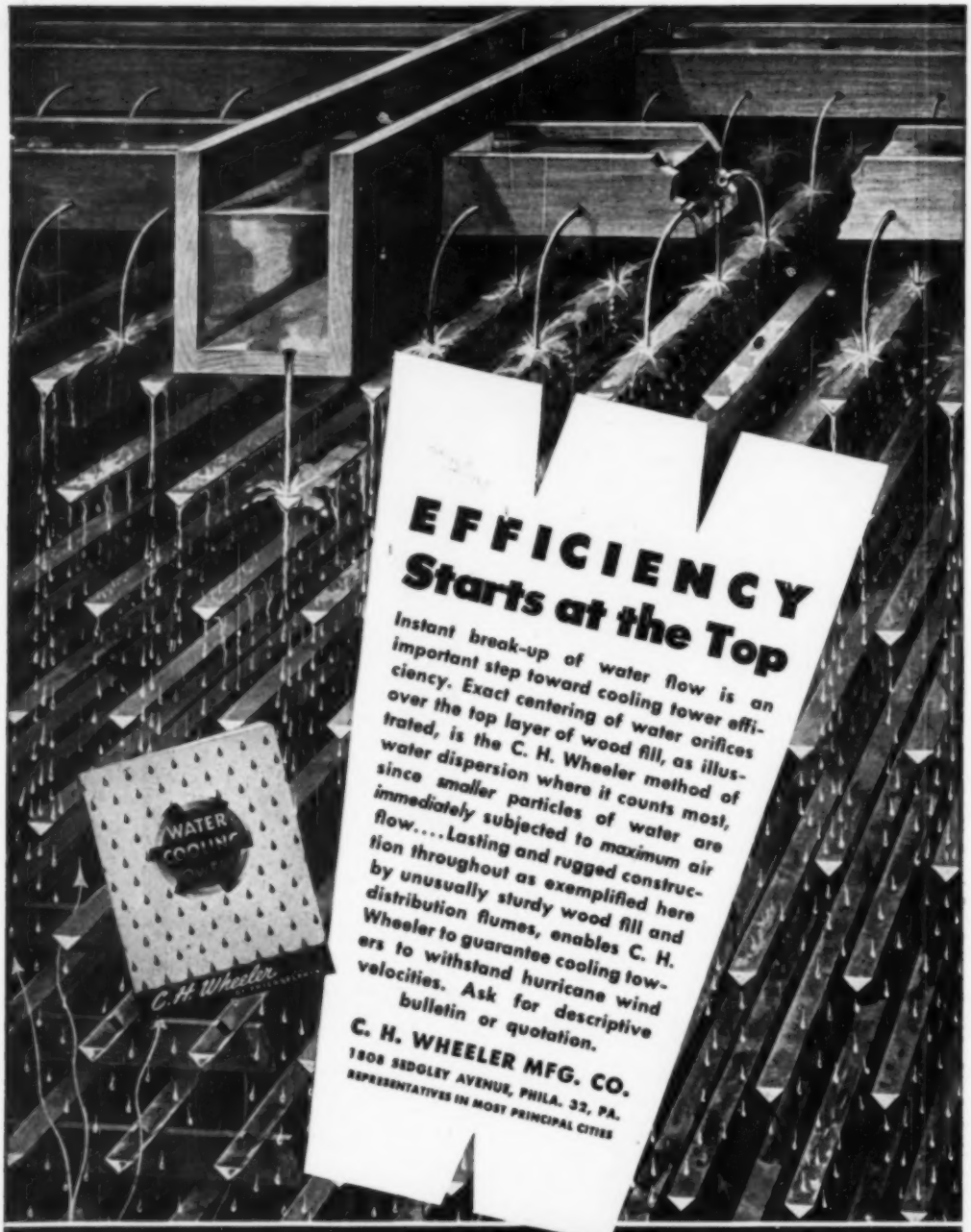
5. EASE OF MAINTENANCE. (a) *Low pressure chamber cover* permits easy access to float and lever arm during calibration. (b) *Entire pressure-tight bearing* easily and economically replaced.

Ask your Taylor Field Engineer, or write for bulletin 98182. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Teflon—synthetic plastic used in bearing surfaces—conforms to stainless steel shaft. Also minimizes friction. Because Teflon is inert to most industrial chemicals, bearing surfaces are generally unaffected by corrosion.

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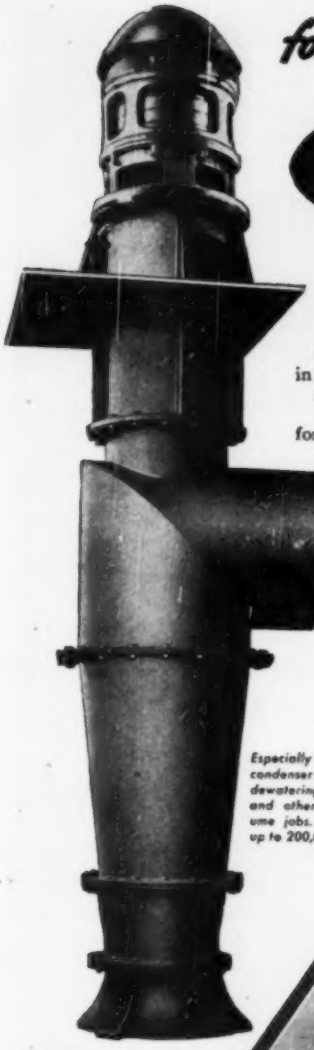
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Apply these facts to your plant and you're money ahead in many ways. For example, Trentweld stainless tubing will outlast ordinary pipe by many years. In terms of eliminated down time for repairs and replacement of lines, this is a dollar saving of major importance. Yet you needn't wait years to enjoy advantages like this. Right from the start Trentweld tubing saves money. Being light-in-weight there is no need for the expensive rigging required by conventional pipe. Even more, Trentweld tubing can be shipped from the mill cold flanged at both ends for vanstoned joints, providing a pipe line that can be assembled easily in record time by your own crew. And lastly, Trentweld is rolled and machine welded by an exclusive process that makes it tougher, structurally stronger — the best of all stainless steel tubing.

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OF PARTS

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This interchangeability of parts is no happenstance. Every part was designed to eliminate variations that might necessitate critical field adjustments . . . and vital parts were built to machine tool precision. In the eyes of expert instrument men, interchangeability is another important advantage that makes M-40 the outstanding modern controller.



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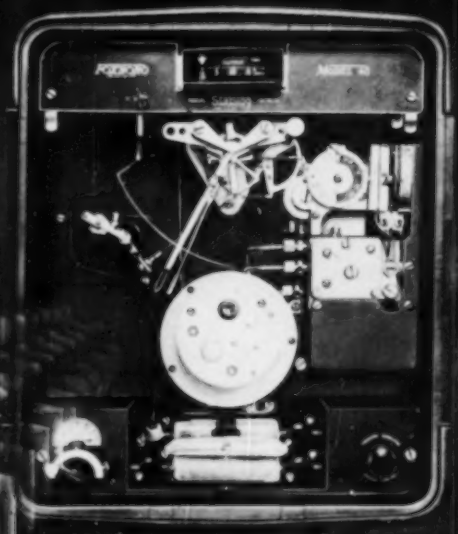
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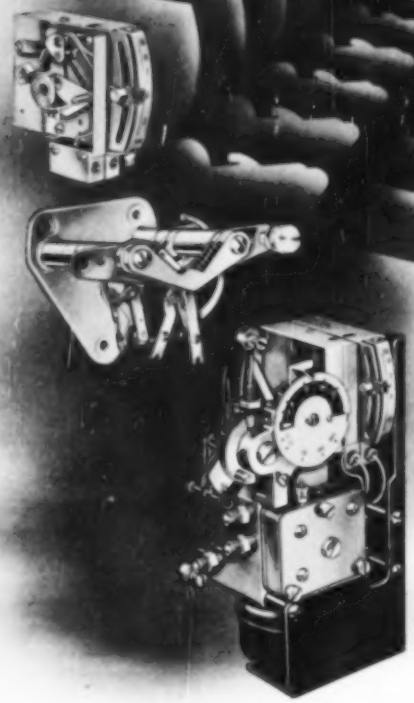
"THE FINEST MODERN CONTROLLER"

AN "EYE-OPENER" IN DUPLICATION OF PARTS



The Model 40 Pneumatic Controller is available for temperature, pressure, flow, liquid level, humidity, density, etc., in a full range of control actions and combinations. Write for Bulletin 381.
The Foxboro Company, 382 Neponset Avenue, Foxboro, Mass., U. S. A.





Identical Performers

because simple, accurate construction makes duplication of parts easy

All main and sub-assemblies of the Model 40 Controller may be interchanged freely without impairing the accuracy and stability of the instrument. If, for example, the control relay should ever need replacing, another may be easily substituted with positive assurance that it will restore the original performance characteristics.

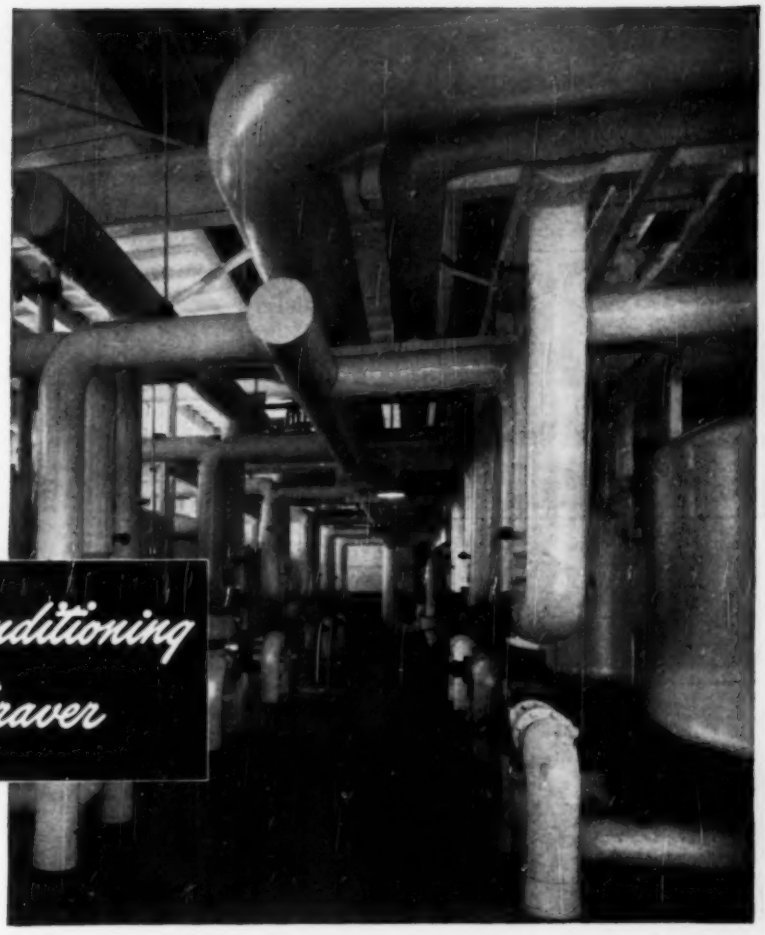
A closer examination of the control relay shows that its design and construction are so basic, so free from complicated parts and critical adjustments, that there are no manufacturing problems in turning out duplicate performers. It also shows that proper alignment of control relay with other parts is automatically assured.

This advanced engineering, typical of M-40 design and construction, is another important reason why M-40 is the finest modern controller.

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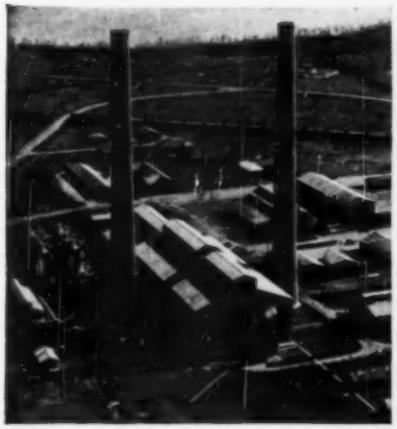
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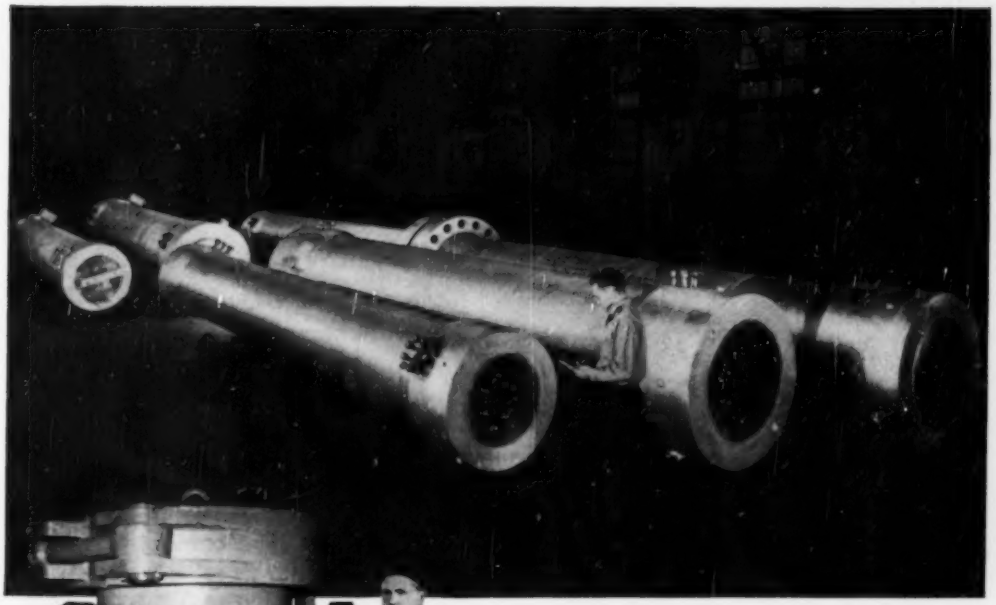
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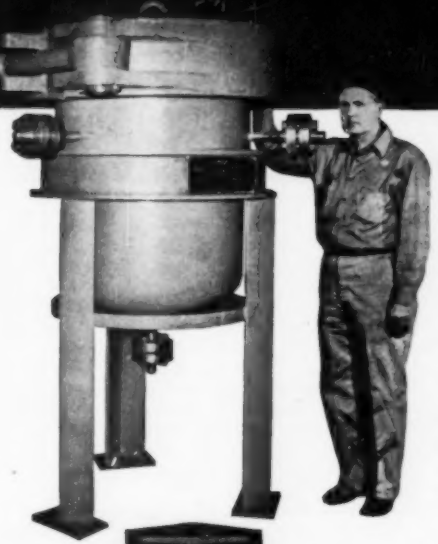
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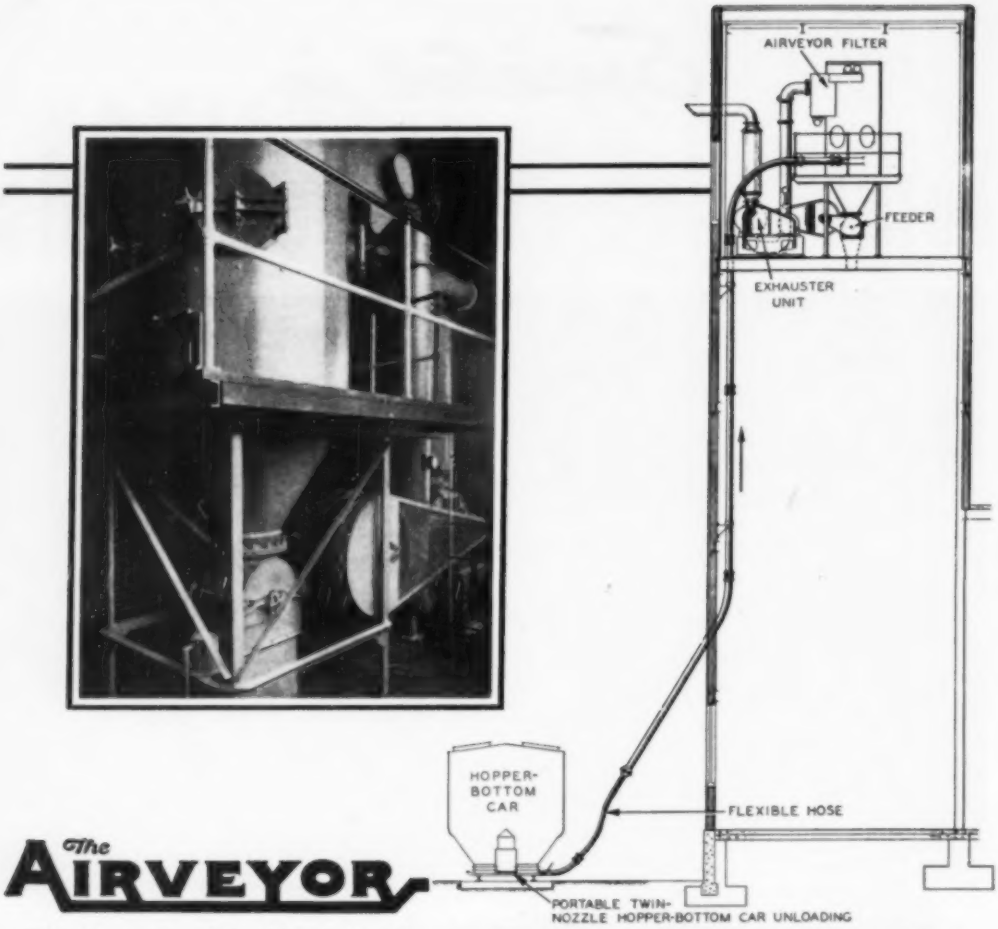
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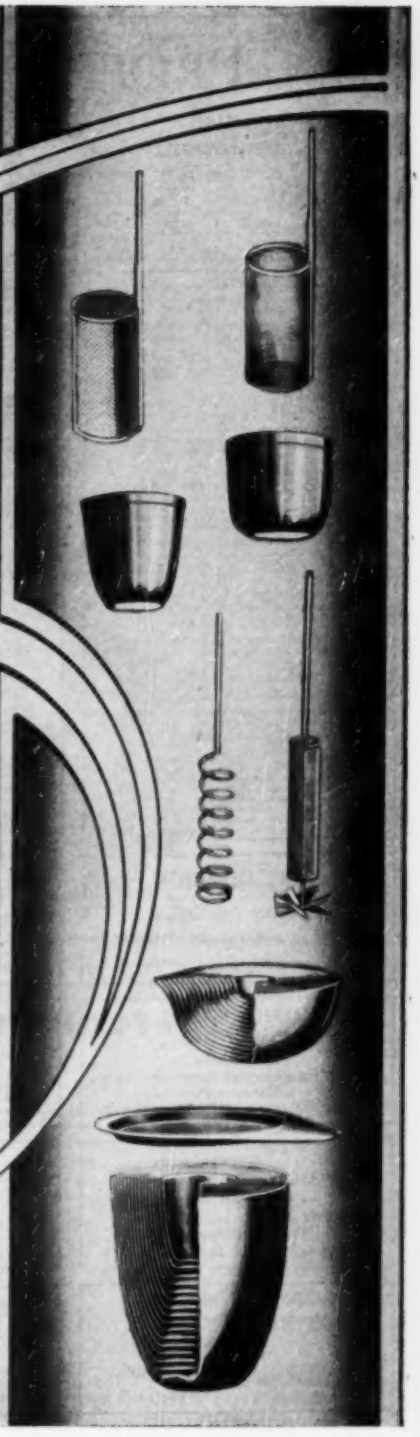
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Write for Bulletin IC-1.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL *Centrifugal Machines*

• • • FOR PROCESSING SYSTEMS





PHTHALIC ANHYDRIDE

Form		Clean, white flakes
Color	Molten	35 Max. (Hazen)
	Solid	Pure White
Solidifying Point		130.5° C Min.
Odor		Slight, characteristic
Insoluble in Water		0.01% Max.
Maleic Anhydride		0.40% Max.
Foam Time		18 minutes Min.

Containers: 5-ply Paper Bags—80 lb. net weight.

Barrett* Phthalic Anhydride is of uniform and unsurpassed quality—pure white, free-flowing flakes containing a minimum of fines.

Carefully controlled for freedom from materials which cause premature gelling and excessive foaming, Barrett* Phthalic Anhydride is widely used in the production of alkyd resins for metal finishes, enamels, paints and varnishes.

Phthalic Anhydride is a basic material in the production of phthalic esters for vinyl resins used in the manufacture of upholstery, handbags, luggage, floor tile, raincoats, shower curtains, etc.

The dyestuff industry finds Phthalic Anhydride essential as a basic material in the manufacture of anthraquinone, dyes, phenolphthalein and other synthetic organic chemicals.

Send for copy of Barrett's 48-page illustrated booklet, "Phthalic Anhydride."

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION

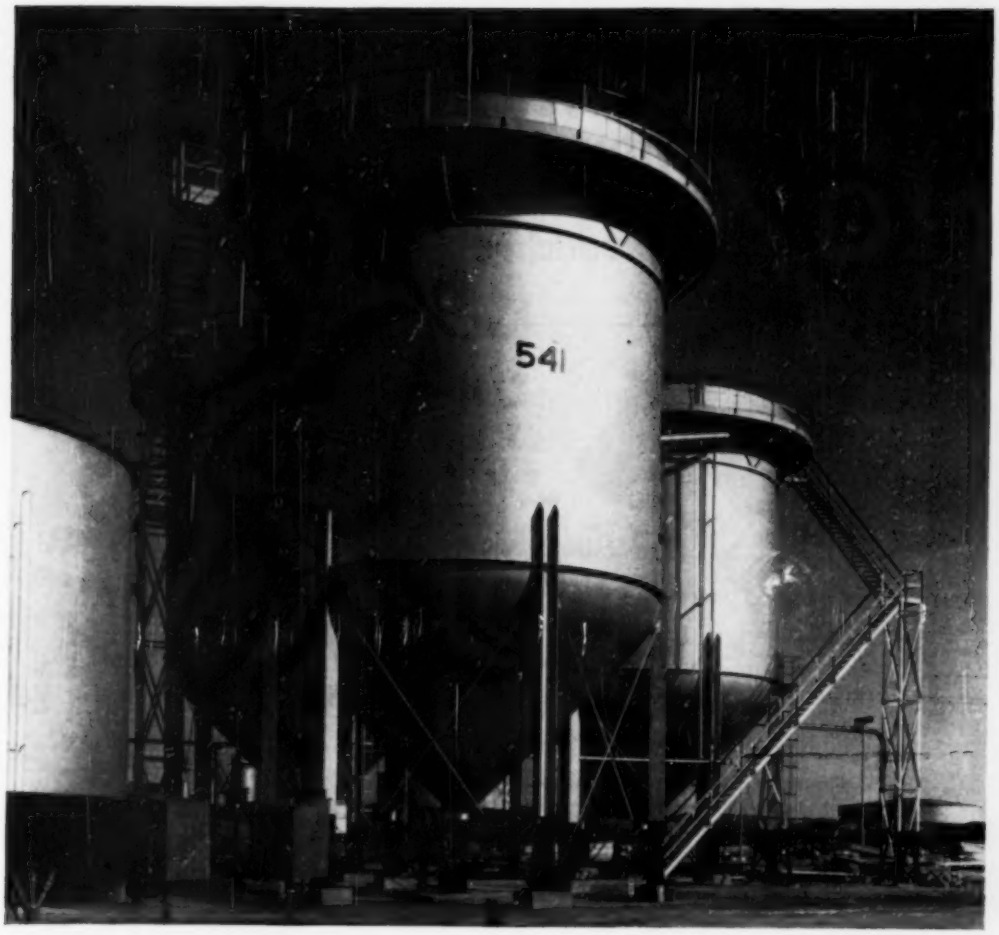
40 Rector Street, New York 6, N. Y.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

Barrett*

*Reg. U. S. Pat. Off.





Steel Tanks Solve a Refinery Disposal Problem

Aeration process separates oil from silt

A petroleum refinery in Louisiana uses water from the Mississippi River for various purposes. The water contains a considerable amount of silt and, during the process, the silt becomes saturated with oil. The three cone-bottom silt aeration tanks shown above are used to separate the oil from the silt.

The water, after being used, flows through large gravity-type separators where free oil is removed. The silt, which has a 20 per cent oil content, settles in the bottom of the separators and is pumped into the three 4,000-bbl. tanks where it is diluted with water. The oil in the silt is removed by repeating an aeration cycle until the oil content is reduced to a negligible amount. This usually takes from 16 to 24 hours. The oil rises to the top and flows over weirs at the top of the tanks, through a trough into storage tanks.

About 500 barrels of silt are aerated per day, yielding from 60 to 80 barrels of oil. The recovered oil is processed and fed back into the refinery stills.

These silt tanks are examples of the "custom" steel structures we build for processing industries. When you need similar equipment, write our nearest office for details.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3 ..... 2120 Healey Bldg.	Detroit 26 ..... 1503 Lafayette Bldg.	Philadelphia 3 ... 1625—1700 Walnut St. Bldg.
Birmingham 1 ..... 1510 North Fiftieth St.	Havana ..... 402 Abreu Bldg.	Salt Lake City 1 .. 1305 First Security Bank Bldg.
Boston 10 ..... 1005-201 Devonshire St.	Houston 2 ..... 2103 National Standard Bldg.	San Francisco 11 ... 1222—22 Battery St. Bldg.
Chicago 4 ..... 2124 McCormick Bldg.	Los Angeles 14 ..... 1405 Wm. Fox Bldg.	Seattle 11 ..... 1305 Stuart Bldg.
Cleveland 15 ..... 2220 Guildhall Bldg.	New York 6 ..... 3318—165 Broadway Bldg.	Tulsa 3 ..... 1623 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

GET CONTINUOUS PRODUCTION

and lower production cost



EMULSIFYING
HOMOGENIZING
THOROUGH BLENDING
DISINTEGRATING

THE Charlotte Colloid Mill operates at high speed and with a system of *continuous production* to give you simplified plant control and lower production cost.

A patented groove design of the rotor and stator enables the Charlotte to operate with not only a hydraulic shear but also a mechanical shear. Great flexibility is assured by Fingertip Microfine Adjustment, rapid cleansing and fast change-over.

You can save floor space, produce a uniform product and cut costs by using the Charlotte Colloid Mill for experiments, research and high-speed dispersion and homogenization of liquids, solids in liquids, and pastes. Available in units of 1 to 75 H.P. and with capacities from 10 to 5000 gallons per hour—for Paint, Food, Pharmaceutical, Insecticide, Rubber, Synthetic Detergent and many other industries. Send today for Catalog E-12.

CHARLOTTE COLLOID MILL

G. M. T. COLLOID MILL CORP.

30 Church Street, New York 7, N. Y.

Exclusive Manufacturer and Distributor

- **Manufacturer's Representatives in Principal Cities**

EXHAUST HOT OR CORROSIVE GASES FROM EXTREMELY HOT AREAS WITH--



BIFURCATOR ROOF VENTILATORS

Where super-heated areas are likely to impair the operation of electric motors or hot, corrosive and inflammable gases create a safety hazard—the BIFURCATOR Roof Ventilator is recommended. Mounted on the roof, these units assure efficient discharge of gases and full accessibility for maintenance. Operate with or without ducts. Available in sizes from 1,090 to 45,200 cfm. *Also special corrosion-resistant construction.*



How BIFURCATOR FAN OPERATES

Cut-away view shows passage of gases around motor which is mounted in separate chamber, open to atmosphere, yet isolated from exhaust fumes.



Certified Ratings

All performance ratings are obtained from accurate wind tunnel tests made in accordance with Standard Test Code of the PFMA and ASHVE for Axial Flow Fans.

Write **for Complete Details — Catalog gives specific data on capacities, sizes, etc.**

DE BOTHEZAT FANS DIVISION, DEPT. C-2
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

Please rush complete data on BIFURCATOR Roof Ventilator.

Firm _____

Address _____

City and Zone _____ State _____

Sender's Name _____

SEARCHLIGHT SECTION

WANTED

OPERATING SUPERVISOR FOR TONNAGE OXYGEN PLANT

Opportunity in new industry for a man with practical experience in industrial oxygen plants.

Write stating experience, age, education and salary required.

Address:

CARTHAGE HYDROCOL, INC.
70 Pine Street
New York 5, New York

TECHNICAL AND RESEARCH ENGINEER

Excellent opportunity for creative and research minded engineer with well established rubber company where his new ideas, inspirational and organizational qualifications will permit him to work with large group of technical and development engineers. This requires above average engineer. Age 30 to 40. Furnish complete information in first letter. Replies held in strict confidence.

P-7108, Chemical Engineering
520 North Michigan Ave., Chicago 11, Ill.

WANTED

SALES ENGINEER

New England manufacturer of industrial instruments offers permanent home office position to graduate mechanical or chemical engineer having actual field experience with process instrumentation. Position involves application engineering, sales correspondence, infrequent traveling. Selling experience helpful but not required. Members of our organization know of this advertisement. Write fully, detailing education and experience.

P-7555, Chemical Engineering,
330 West 42nd Street, New York 18, N. Y.

WANTED

SALES ENGINEER

Established manufacturer of materials of chemical construction; acid proof cements, tank linings and protective coatings, has opportunity for graduate engineer with technical sales experience. New York and surrounding territory, salary and commissions. Give details of education, experience, etc., in first reply.

SW 7885 Chemical Engineering
330 West 42nd St., New York 18, N. Y.

CHEMICAL ENGINEERS

JUNIORS — SENIORS

We are seeking top grade men for the better positions—salaries, $4,105—$12,500.

Please write: — Gladys Hunting

CASTLE & ASSOCIATES, INC.
220 So. State St. Chicago 4, Illinois

CHIEF CHEMIST

Product Control Laboratory of Mfg. edible fats and fatty acids. Must be energetic, vigorous and capable.

Write stating complete details

PETER KALUSTIAN, *Prod. Mgr.*

E. F. DREW & CO., INC.
BOONTON, N. J.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

POST OF Works Superintendent in an Electrolytic Caustic Soda and Chlorine Plant situated abroad in the East. Applicant should be well qualified and considerably experienced in running, maintenance and development. He should preferably be conversant with the problems of Chlorine utilization and should be in a position to set up Pilot Plant and conduct operation leading to full development of chlorinated products—both organic and inorganic. Applications will be treated in strict confidence. P-7467, Chemical Engineering.

RESEARCH CHEMIST or engineer wanted by new midwestern chemical company with source of cheap fuel and abundant water supply. Additional products needed. Can offer attractive salary with commission or royalty basis for new products ready for manufacture. P 7681, Chemical Engineering.

WANTED: MAINTENANCE supervisor to act as assistant to Maintenance Superintendent; experience in heavy chemical industry essential; must have ability to get along with workers under Union Contract, and be capable of supervising and instructing workers on machine repairs, proper pipefitting methods, and welding. Modern plant in West Virginia; excellent working conditions; stable employment. P 7764, Chemical Engineering.

CHEMICAL ENGINEER—Recent graduate of recognized college or university with supervisory ability for technical position in production department of large chemical plant producing synthetic resins. Salary commensurate with ability and experience. Submit full particulars as to qualifications. Location, Midwest. Address P 7742, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (39 years recognized standing and reputation). The procedure of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 260 Dun Bldg., Buffalo 2, N. Y.

EXECUTIVES $3,000-$25,000. This reliable service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

CHEMICAL ENGINEER, 34, with varied design and production experience on hydrometallurgy, (unique experience of large scale production of pure Cobalt and Tungsten) Petroleum Refining and General Chemical work, seeks suitable new plant. British National, at present in England wishes to work in U. S. PW 7747, Chemical Engineering.

PHYSICIST - X-RAY EXP. $4-$6000

SENIOR SCIENTIST—PHYSICS DEG.	$6,000
BACTERIOLOGIST—FOOD EXP	$3,900
BIO-CHEMIST—Ph.D OR EXPD	$4,000
PHARMACEUTICAL CHEMIST	$4,200
GRAD. CHEMS OR CHEM ENGRS.	$3,600

Inquiry Invited—Strictly Confidential

SHAY AGENCIES
30 W. Washington Chicago 2, Ill.

Executive Experience *Available*

Senior executive with wide diversified administrative experience covering sales, manufacturing, and buying desires connection in the chemical or allied industries where his broad knowledge, acquaintanceship, and experience will make him a valuable asset.

His past experience in chemicals, paints, industrial finishes, printing inks and their various intermediates and components was gained from association with two of the largest companies in the industry.

His availability at this time is due to a drastic change in top management in the corporation he has been associated with for nearly fifteen years.

PW 7173 Chemical Engineering
330 West 42nd St., New York 18, N. Y.

CHEMICAL EXECUTIVE AVAILABLE

Senior executive with diversified knowledge of salt, food and feed. General plant, products control. Chemical research and engineering experience. B.S. Degree. Available as Technical Director or Plant Manager.

PW-7889, Chemical Engineering
520 North Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED

STUDENT CHEMICAL Engineer, Sophomore student in chemical engineering, age 22, 4 years experience Chemical Processing industry. Want summer employment, with agreement of remaining with company after graduation if work is satisfactory. Willing to accept shift work, and small salary to gain experience. No preference to geographical location. PW 7739, Chemical Engineering.

CHEMICAL-WELDING Engineer, 8 yrs. experience as welding engineer and metallurgist. Qualified consultant on materials and processes. PW 7349, Chemical Engineering.

CHEMICAL ENGINEER: Thoroughly experienced in process development, plant design, construction, and manufacturing in organic chemicals field. Seeks position as chief engineer with progressive company where outstanding ability and effort can be utilized fully. PW 7873, Chemical Engineering.

MECHANICAL DESIGN Engineer, 20 years experience: plant and piping layout, process equipment design, supervision of construction and organization of engineering personnel with leading chemical companies and engineering firms. Age 43. Presently employed. Desire position as Chief Engineer with small company. PW 7834, Chemical Engineering.

CHEMICAL ENGINEER, 10 years experience. Six years in the acid and explosives fields. Presently employed in plant design and construction. Desires responsible position in production. Age 31, married, family. PW 7822, Chemical Engineering.

SELLING OPPORTUNITIES WANTED

(Additional Selling Opportunity ads on page 388)

SALES ENGINEER calling on medium and large industries in Philadelphia, central Penna., New Jersey, and Delaware area. Seeking connection in the chemical, mechanical or metallurgical field. Technically trained—good connections. Go getter. Write RA 7862, Chemical Engineering.

ESTABLISHED MANUFACTURERS' Agents seeks additional representation New York metropolitan area. Interested in petroleum, chemical processing and industrial equipment. RA 7846, Chemical Engineering.

BUSINESS OPPORTUNITY

For Sale or development

an enormous deposit of uniform, light weight, non-abrasive, neutral and inert, non-metallic material, analyzing approximately 70% silica, 15% alumina and less than 1% calcium, suitable for oil and gasoline refining, etc., filler or diluent or manufacture of fiber-glass and other allied products, located on railroad and near the chemical manufacturing district of Texas, where abundant supply of natural gas is available. Write to J. F. Chupick, Fayetteville, Texas.

EQUIPMENT ACCOUNTS WANTED

Mechanical engineer, good contacts in Texas Gulf Coast area, wants to represent manufacturers of mechanical equipment of type used in oil refineries, gasoline plants, chemical plants. Headquarters in Houston. *Write*

P. O. Box 931 Houston 1, Texas

DEPARTMENT OF THE ARMY

INDUSTRIAL FACILITIES

AVAILABLE FOR LEASE

LOCATED AT

HOLSTON ORDNANCE WORKS—KINGSPORT, TENNESSEE. U. S. Hwys 11, 23. Tenn. Hwy 81; N&W RR, L&N RR, Southern RR, Clinchfield RR. Traversed by Holston River.

MILAN ORDNANCE CENTER—MILAN, TENNESSEE. served by Tenn. Hwys; L&N RR, Ill. Central RR.

ALABAMA ORDNANCE WORKS—SYLACAUGA, ALABAMA. U. S. Hwys 11, 91; Southern RR, Central of Ga. RR, AB&C RR.

VOLUNTEER ORDNANCE WORKS—TYNER, TENNESSEE. U. S. Hwy 11, Tenn. Hwy 58; Southern RR, NC& St. Louis RR near Tenn. River.

HUNTSVILLE ARSENAL—HUNTSVILLE, ALABAMA. U. S. Hwy 72; Southern RR, NC& St. Louis RR; Tenn. River dock facilities.

CONVERSION POTENTIAL includes the manufacture of fertilizers; wood pulp and paper products; textile and textile products; large and small industrial operations for chemicals and chemical products; plastics; processing; packing and storage of foods, beverages, and tobacco and their products; building materials and furniture; metal and alloy products; electrical appliances and accessories; electronic equipment and parts; packaging and assembly line products.

LOCAL LABOR is available at all sites.

RAILROAD TRANSPORTATION is available to all facilities, including railroad network within the plant areas. Mainline connections to plant and warehousing facilities in most instances.

ELECTRIC POWER, STEAM, WATER and other utilities are available in large quantities. Sewage disposal facilities are installed on the sites.

CONSTRUCTION varies from "permanent", with brick or reinforced concrete and steel to "temporary", with skeleton steel and wood construction and masonite or wood walls. Floors fit specific requirements. Ceiling clearances range from 8' to 30'. Floor spaces are from 10,000 to 110,000 sq. ft.

Address all requests for complete information and "invitation to bid" to:

Mobile District
Corps of Engineers
Real Estate Division
P. O. Box 1169
Mobile 7, Alabama

WANTED

CENTRIFUGAL CHEMICAL PUMP MANUFACTURER

who desires aggressive representation by a firm of chemical and mechanical engineers, acting as manufacturers' representatives on a commission basis. Thoroughly conversant and familiar with pump problems in the process industries. Territory covered includes northern New Jersey, New York State east of Rochester and Metropolitan New York, western Massachusetts and Connecticut.

Chemical Pump and Equipment Corp.
75 West Street, New York 6, N. Y.

SALES REPRESENTATION

For manufacturer of process equipment, mixing equipment, and agitators in the Detroit, Buffalo, Boston, Philadelphia, Houston-Dallas territories.

RA-7726, Chemical Engineering
330 West 42nd Street, New York 18, N. Y.

CASH PAID
For Capital Stock or Assets of
CHEMICAL PLANT
• WANTED

By large financially powerful diversified organization wishing to add another enterprise to present holdings.
Existing Personnel Normally Retained

Box 1221
1474 B'way N. Y. 18, N. Y.

AVAILABLE . . .
RECOVERY FACILITIES
All types crude mixtures
DISTILLATION and EXTRACTION
High Temperature High Vacuum
Simple Distillation Difficult Fractionations
Separation of close-boiling Sterols, isomers, and azeotropes our specialty
Drum Lots - Tank Cars

TRULAND
CHEMICAL & ENGINEERING CO., INC.
P. O. Box 426, Union, N. J. Unionville 2-7260

STAINLESS STEEL SPECIALISTS
STAMPED - FORMED - WELDED
STAINLESS STEEL PRODUCTS
Send drawings (Est. 60 Years)
C. W. CARLL SONS
Cole & Linwood Sts. Trenton 8, N. J.

IN UNION THERE IS
MAHONEY FOR MACHINERY
NEW—USED—REBUILT
A NEW HIGH IN PERSONAL SERVICE
"Machinery Shopping" for the Busy Plant Executive. We locate equipment you need or buyer for your surplus. "Finder's Fee" Basis.
PROCESSING - PACKAGING MATERIALS HANDLING
982 Stuyvesant Ave. Union, N. J.

(Additional Plant For Lease Advertisement on page 395)

LIQUIDATING the Machinery and Equipment of the Coated Fabrics Division of

ATLAS POWDER COMPANY AT THEIR STAMFORD, CONN., PLANT

It is still set up, as it was operating—MOVING FAST!—This is your opportunity to get machines NOW. Our representatives are at the plant.



GET CASH FOR YOUR IDLE PLANT or MACHINERY SELL TO CONSOLIDATED

Here Are Some of the Principal Items:

RUBBER & PLASTICS COMPOUNDING

1—24" x 66"—3 roll Calender, herringbone gears throughout, with reduction drive. Variable Speed Motor, Controls and all accessories.
1—22" x 20" x 60" Erie Mill, installed new, 1948, with Reduction Drive, 125 HP. Synchronous Motor & Controls.
1—Line of 2—22" x 20" x 60" Mills with reduction drive, motor and controls.
1—Line of 4—20" x 48" Mills with reduction drive, motor and controls.
1—18" x 48" Farrell Mill with reduction drive, motor and controls.
1—No. 3 Banbury Mixer, with motor and controls.
1—100 gallon Baker Perkins jacketed double arm Mixer, heavy duty, with drive and 40 HP. Motor.

MIXERS

6—Steel Simplex Turbo Mixers, with bolted on covers, each with Turbo Mixer Drive 4B, Falk Motoreducer Ratio 8-1, and Lewis Allis 15 HP. 3/60/220-440 1760 RPM Explosion proof motor and starters, capacity each Mixer 325 gals.
1—Baker Perkins 100 gallon working capacity, jacketed, double geared, sigma blade, power tilting, motor driven Mixer, 40 HP. G.E. 3/60/440.
10—American Tool & Machine Co. all steel vertical Rubber Churns or Mixers, 36" x 36", 200 gals. each, belt driven agitator drives, paddle arm agitators, large molasses gate outlet.
10—Pony Mixers, 15 to 50 gals.

TANKS

2—Stainless steel Tanks each 350 gallon capacity, belt driven propeller agitators.
30—Vertical and horizontal steel, riveted and welded, from 2,000 gals. to 12,000 gals.
7—Blue enamel, 30" x 30", 100 gal. ea. Bolted on dished covers with 14" manhole, 2" bottom outlet, leg supports. 1 with enameled paddle agitator, belt driven.

PEBBLE MILLS & GRINDERS

14—P. O. Abbe 38" x 42" Burrstone and porcelain lined, tight and loose pulley drive, liquid discharge gate.
3—Colloid Mills, each directly connected to 2—Terry 10 HP. 5000 RPM Steam Turbines.

PUMPS

Viking Gear Pumps—all iron with safety valve. All directly connected to Explosion proof motors 3/60/220-440. Running from 1½" with 3 HP. to 4" with 30 HP. motors.

SCALES

Approximately 30 Toledo Dial Scales, Portable Bench and floor type, range 500-3000#.

SPEED REDUCERS & MOTORS

A large variety of Reeves Vari control, Falk & Link Belt PIV reducers with motor assemblies ranging from 1½ to 30 HP.

Send all inquiries to CONSOLIDATED PRODUCTS CO., P. O. Box 1115. Phone Stamford 3-2171

SOME OF THE PRINCIPAL ITEMS AT OUR NEWARK SHOPS

OLIVER ACID PROOF FILTER

8' dia. x 12' face—closed, lead covered heads, wood staves, 15" lead valve with Duriron wear plate, lead internal piping, lead lined trough, rubber covered oscillating agitator; rubber lined vacuum receiver.

ROTARY KILN

1—8' x 125' Reeves Bros. ROTARY KILN, ⅜" shell, 2 support type, 14" steel tires, 12" wide girth gear, equalizing type supports. KILN now in 1-125' section on cribbing alongside railroad siding for immediate shipment. Refractories removed.

DRYERS

8 x 50 Louisville Rotary Steam Tube.
8 x 23 Hersey Rotary Hot Air.
3'6" x 28' Direct Heat Rotary.
5' x 33' Rotary Vacuum.
32" x 72" Buffalo Double Drum Atmospheric.
28" x 60" B&C Double Drum Atmospheric.
Buffalo Vacuum and J. P. Devine Vacuum Shell, 40 x 42, 5, 6, 9 Shelves.

CRUSHING & GRINDING, PULVERIZING

1—Raymond 5-roll High Side, complete with motor accessories.
2—Raymond No. 000 Pulverizers.
1—Raymond No. 0000 Pulverizers.
1—Size B—Erie City motor driven Coal Pulverizer.
1—Raymond 4-roll High Side.
1—Jeffrey 24 x 20, type B, Hammer Mill.
1—Williams 2XX Roller Bearing Hammer Mill.
1—Micro 4TH 24".
1—JB No. 2 Hammer Mill.

MIXERS

2—Baker Perkins, Size 17, Jacketed, 280 gallon capacity.
1—W & P, Size 16, Unjacketed, 150 gallon capacity.
6—Baker Perkins, Size 15, Jacketed, 100 gallon capacity.
1—W & P, Size 14, Unjacketed, 50 gallon capacity.
1—W & P, Size 12, Jacketed, 20 gallon capacity.
1—3,000 lb. J. H. Day Dry Powder, motor driven.
1—1,000 lb. J. H. Day Dry Powder, motor driven.
1—1,000 lb. Stedman Drum Mixer, motor driven.

FILTERS

1—No. 12 Sweetland, 4" centers, iron or copper leaves.
1—No. 10 Sweetland, 2" centers, iron or copper leaves.
1—No. 5 Sweetland, 2" centers, copper leaves.
1—8 x 12 Oliver Acid Proof.
2—8 x 12 Oliver all steel.
3—8 x 10 Oliver wood staves.
3—36" Sperry 60 plate cast iron, Recessed, center feed, open delivery, hydraulic closing.
4—30" Sperry Skeletons—gear closing.

ONLY A PARTIAL LIST—SEND US YOUR INQUIRIES

WANTED: YOUR IDLE MACHINERY SEND US YOUR LIST NOW!

THE KEY TO SAVING TIME AND MONEY

CONSOLIDATED PRODUCTS COMPANY, INC.

15 Park Row, New York 7, N. Y.—Tel. BArclay 7-0600

Shops: 335 Doremus Ave., Newark, N. J. Cable Address: Equipment, N. Y.

WE BUY AND SELL SINGLE ITEMS TO COMPLETE PLANTS

WE ARE LIQUIDATING THE MACHINERY AND EQUIPMENT OF PLANT FORMERLY OPERATED BY WESTERN ELECTROCHEMICAL CO. AT 2630-50 E. WASHINGTON BLVD., LOS ANGELES, CALIF.

PUMPS

1—6" x 2" Corrisiron Centrifugal Pump with 7½ HP, Totally Enclosed Fan Cooled Motor, 440 Volt, 60 Cycle, 3 Phase AC
2—Duriron Model 60 Centrifugal Pump Direct Connected to 7½ HP, 3 Phase 60 Cycle, 220/440, 1750 RPM, Drip Proof Ball Bearing Sterling Electric Motor Type KF
1—LC 6 3" x 2" Corrisiron Pump Complete with 7½ HP West. Motor, 220 Volt, 3 Phase, 60 cycle
4—1½" Nasprine Ods Pump with Mechanism attached thereto
2—6" x 1½" Corrisiron Centr. Pump with 5 HP Motor, 440 V., 60 Cy., 3 Ph.
3—Duriron Model 40 Centrifugal Pump Direct Connected to 5 HP, 3 Phase, 60 Cycle, 220/440 Volt, 1750 RPM
1—LC 6—2 x 1½" Corrisiron Pump Complete with 5 HP West. Splash Proof Motor, 220 Volt, 3 Phase, 60 Cycle
1—Duriron Model 40 Centrifugal Pump Direct Connected to 3 HP, 3 Phase 60 Cy., 220/440 V., 1750 RPM, Drip Proof Ball Bearing Sterling Elec. Motor
1—Duriron Model 40 Centrifugal Pump 7½ HP, 3 Phase, 60 Cycle, 220/440 Volt, 1750 RPM, Drip Proof Ball Bearing Sterling Electric Motor
3—6" Bilton Bryan Jackson Centrifugal Pumps Integrally Mounted with 1—40 HP, 1750 RPM, 440 V, 3 Ph, 60 Cy, Sterling El. Splash Proof Motors
5—Duriron 8x6 Exhaust Fans with ½ HP, 3 Phase, 60 Cycle, 220/440 Volt, 1800 RPM General Purpose Drip Proof Sterling Motors.
2—Corrisiron Centrifugal Pump 2" x 1½" with 7½ HP, Splash Proof Motor 440 Volt, 60 Cycle, 3 Phase AC
5—Duriron Model 40 Centrifugal Pump Direct Connected to 7½ HP, 3 Phase 60 Cycle, 220/440 Volt, 1750 RPM, Drip Proof Ball Bearing Sterling Electric Motor Type KF
1—Duriron Model 40 Centrifugal Pump with Totally Enclosed Fan Cooled Ball Bearing G.E. Motor Type K
1—Duriron Model 40 Cent. Pump with Drip Proof Ball Bearing Sterling Motor
6—Duriron Centrifugal Pumps K 3 MD-74-2"x1½" Electric Motors, 2 H.P. 3 Phase, 60 Cycle, 220/440 Volts, 1800 RPM. Totally Enclosed Fan Cooled Ballbearing Frame
6—Duriron Centrifugal Pumps K2 MC-62-1½"x1½", Electric Motors, 2 H.P. 3 Phase, 60 Cycle, 220/440 Volts, 1800 RPM. Totally Enclosed Fan Cooled Ball Bearing Frame
1—2" x 1½" Corrisiron Centrifugal Pump with 3 HP Splash Proof Motor, 440 Volt, 60 Cycle, 3 Phase AC
2—Duriron Model 40 Series 74 Centrifugal Pumps Direct Connected to 5 HP, 3 Phase, 60 Cycle, 220/440 Volt, 1750 RPM, Drip Proof Ball Bearing Sterling Electric Motors Type KF
2—3" Bronze Fitted Pumps Directly Conn to 2-10 HP, 1700 Cy. 220 V. 3 Ph Motors
1—Bracket Pump #1135 Driven By One 3 HP, 3 Phase, 60 Cycle, 220/440 Volt 3500 RPM, G.E. Motor 5C27465
1—Nash Hytor Vacuum Pump with 5 HP Motor

TANKS

2—Steel Tanks 120" Diameter x 14' High Amercoat Lining with 30" Ni-Resist Turbine Agitator Driven By 7½ HP Sterling Slo-Speed Motors
2—Steel Tank 8'6" Diameter x 6' High Amercoat Lining with 29" Ni-Resist Turbine Agitator with Sterling Slo-Speed Motors
3—Steel Precipitator Tank 6' Diameter x 7' High, Amercoat Lining with 24" Ni-Resist Turbine Agitator with Sterling Slo-Speed Motors
2—Thickener Steel Tank 10' Diameter x 6' High, Amercoat Lining with Type A Dorr, Thickener Mechanism Including One HP Drive Unit and Gear Motor and 2" Yeo Pump Including ½ HP Drive Unit
1—Steel Dorr Clarifloculator Tank 18' Diameter x 7' 0" High Amercoat Lining with 1 Dorr Clarifloculator Mechanism Including 2 Speed Drive Head Gear Motor
1—Steel Clarifloculator Overflow Tank 15' Dia x 6'0" High Amercoat Lined
1—Steel Storage Tank 10' Diameter x 7' High, Amercoat Lining
1—10-8 Stainless Steel Storage Bin Hopper, 10' x 2' x 7', Cu Ft Cap
2—Stainless Steel Filter Yanks 20" Diameter x 27" High with Wall Partes Filter Tubes
1—Nickle Clad Steel Dissolving Tank Flat Bond Concrete Bottom Complete with Agitator Drive and Agitator Drive Sliding Vertical Gear Head Motor 5 H.P. 3 Phase, 60 Cycle, 440 Volt, 80 RPM
1—Nickle Clad Salt Dissolver Tank, 79" Diameter x 6' High with 24" M 1 Resist Turbine Agitator Driven by 5 HP, 60 Cycle, 1800/54 RPM, 220/440 Volt, 284 Frame, Slow Speed Motor
2—Pfaudler Standard 1000 Gallon Glass Lined Steel Tanks 1082 XL Series Complete with Anchor Agitator Motor Drive 7½ H.P., 3 Phase, 60 Cycle, 440 Volt, Explosion Proof Motor, Serial Numbers, 23248 and 23250
1—Structural Steel Storage Bin 18'x 9', 70 Ton Capacity
1—Goodrich Rubber Lined Acid Storage Tank, Capacity 1625 Gallons
1—25,000# Storage Tank, 7'6" x 7'0" x 18' High with Number 3 MC JeRry 7292 Electric Vibrating Feeder
1—1625 Gallon Goodrich Vulka Lock HCL Storage Tank Complete with Rubber Lining and Safety Heads with Safety Head Diaphragms
1—Redwood HCL Supply Tank 60" Diameter x 9' High
2—Steel Feed Tanks 120" Diameter x 10' High Amercoat Lining
2—Steel Feed Tanks 84" Diameter 9' High Amercoat Lining
4—Steel Effluent Storage Tanks 84" Diameter x 9' High Amercoat Lining
2—Steel Sump Tanks 4' x 5' x 5' with Transite Covers
2—Steel Sump Tanks 3' x 5' x 3' with Chemstone Covers and Amercoat Lining
1—8' x 18' x 10' Rect. Steel Tank with 3/16" Rubber By Goodrich

PACKING MACHINERY

1—7" Vertical Redler Runaround Conveyor, 80' Horizontal Length x 23' Vert Complete with Drive and Motor and Equip Incidental Thereto
1—10,000 # Welded Steel Blender, 1500 Cubic Foot Capacity with 7½ HP Drive, V 75 Electric Vibrator and Controller
1—#3 Special Low Head Jeffry Traylor Electric Barrel Packer, 440 Volt, 3 Ph, 60 Cy, Complete with One Toledo Floor Scale with 30" x 48" Platform
1—V-75 Citron Electric Vibrator Complete with Controller
1—16" x 12" Style #1 S.A. Enclosed Type Rotary Vane Feeder 1½ Cubic Foot Capacity at 3 RPM Complete with ¼ HP Jannette Motoreducer and Sprocket and Chain
1—6" Diameter x 22' Long Screw Conveyor at 35 RPM Complete with Shaft Coupling and Drive
1—25,000 Capacity Weigh Bin Approximately 7'0" x 7'0" x 13'6" High with Double Hopper Bottom Complete with Jeffry Traylor Electric Vibrating Feeders, Toledo Hopper Scale, Automatic Bin, Level Switch and Motors
1—V-55 Citron Electric Vibrators 110 V, 60 Cy, Complete with Controller
1—#10 Impeller Mill Including Hopper from Dryer to Grinder and Feeder Driven by Sterling Motor, 20 H.P., 2 Phase, 1800 RPM, 60 Cycle 220/440 Volts, Serial Number—125642
2—6" x 20'-1" Centrifugal Discharge Bucket Elevators, Approximately 18' Center Complete with ¼ HP Motor Drive

CRYSTALLIZERS

2—Jacketed Nickle Clad Steel Crystallizing Tanks with Fittings: Dished Head, Concrete Bottom, Agitator and Agitator Drive Equipped with Sterling Vertical Gear Head Motor, 3 Phase, 3 HP, 60 Cycle, 440 Volt
2—Crystallizer 40' Long Swanson-Walker Single Deck and Continuous Crystallizer of Steel and Cast Iron Construction Complete with All Connections Supports Agitator and Drives
2—Homogeneous Lead Lined Crystallizers Welded and Lead Lined with Two 24"-16 Blade Agitator Motors, Serial Numbers—139579 and 139581

CENTRIFUGES

2—Tolhurst 40" Suspended Centrifugals D. M. D. of a Steel case Lined with Shoot Monel Bucket, with Monel Plate Valve, Monel Sleeve Driven by Two Speed Totally Enclosed Fan Cooled Motors, 450-700 RPM with Water Tight Two Speed Control, 4497, 3 Phase, 60 Cycle, Serial Numbers T 16139A and T 16139B
1—18" x 29" Bird Solid Bowl Centrifugal Filter of Monel Metal Construction and Complete with Explosion Proof Motor and Other Incidental Equipment

COOLING TOWERS

1—Floor Induced Draft Cooling Tower, 31 x 19 x 33—25 H.P. Totally Enclosed Motor 1750 RPM, 440 V, 60 C. 3 Ph., together with Shafts and Pumps
1—Floor Cooling Tower

DRYERS

1—Louisville Rotary Counter Current Direct Heat Dryer 35" x 30' Includes Refractory and Insulation Lining for Combustion Chamber Exhaust Fan with 3 HP, 440 Volt, 3 Phase, 60 Cycle, Totally Enclosed Motor; Dust Collector with 5 HP, 440 Volt, 3 Phase, 60 Cycle, Totally Enclosed Ball Bearing Motor for Dryer Drive, Burner with ½ HP, 440 Volt, 3 Phase, 60 Cycle, Totally Enclosed Ball Bearing Motor
1—Sodium Perchlorate Dryer—Thermo Chemical Dryer Complete with Line Stainless Heaters

REFRIGERATION UNITS

2—Refrigeration Unit Including 2 Brine Centrifugal Bronze Fitted Flexibly Coupled to a 3 HP, 440 Volt, 60 Cycle, 3 Phase, 4 Pole Drip Proof Sterling Motor Capacity 180 G.P.M. and with All Controls and Mechanism Incidental Thereto

HEAT EXCHANGERS

1—Heat Exchanger Consisting Pyrex Tubing and Steel Pipe 577 Sq. Feet of Surface Welded Steel Frames
1—Heat Exchanger Consisting of Pyrex Tubing and Steel Pipe 232 Sq. Feet of Surface
1—Heat Exchanger Consisting of Pyrex Tubing and Steel Pipe 135 Sq. Feet of Surface
1—Heat Exchanger

MISCELLANEOUS

1—Laboratory Drying Oven 110 Volt, 700 Watts AC-DC 6.4 Amps.
1—Gas Analyzer Fisher
Laboratory Double Fume Hood and Blower Wall Cases, Laboratory Desk and Stools
Federal Laboratory Air Classifying Unit B-2 Equipped with 110 Volt Fan and Motor Screw Feeder and Copper Feed Hopper
1—Fisher Unitized 310-12 Gas Analyzer with Carrying Case
1—Gas Scrubber Unit Consisting of 3 Duriron #10 Exhaust Fans and One Duriron #10 Exhaust Fan with ½ H.P. 3 Phase, 60 Cycle, 440 Volt, 1800 RPM Totally Enclosed Sleeve Bearing Sterling Motors
2—75 H.P. #130 Boilers, 50" Shell Inside Diameter 16 Foot Shell Length ¼" Shell Thickness, 80 Tubes 2", One 1000 Gallon Fuel Tank, One Electric Drive Fuel Pump with Relief and By-Pass Valve
Westinghouse Generator, 100 KW, 140 Volt, 715 Amp., 870 RPM, Type SK Frame 180 Harr, 874 Direct Drive by WH Induction Motor, 870 RPM, 2200 Volts
2—6 Cubic Foot Skip Hoists Complete with 2 HP Motors Electric Control and Brake, Steel Frame and Stainless Steel Bucket
1—Budget Hoist Consists of Budget Frame 6-6 Electric Hoist with Standard 10' Lift, 440 Volt, 3 Phase, 60 Cycle, Serial Number-47455
1—Sodium Chlorate Liquid Clarifier with Dorr Clarifloculator Mechanism
1—S.A. Single Power Shovel Machine, Complete with Scoop Swivel Sheave Roller Chain Drive, 5 HP Motor Reducer and Standard Swinging Shovel Boom
1—Centrifugal Discharge Bucket Elevator, 8" x 5" x 35' Complete with Drive Belt and Buckets, Shafts and All Equipment Incidental Thereto.
1—Screw Conveyor 9" Diameter x 40', 25 RPM Complete with Drive Shaft and All Equipment Incidental Thereto.
1—8" x 5" x 38'-7" Centrifugal Discharge Bucket Elevator Complete with Drive Belt and Buckets and Equipment Incidental Thereto.
1—Steel Weigh Hopper, 5' x 5' x 6'0" High. Made of 3/16" Plate and Fitted with Toledo Model 2500 Suspension Hopper Scale Complete with Jingle Mercury Magnetic Cut Off, 10,000# Dial with 10# Graduations and 2A Jeffry Traylor Electric Vibrating Feeder 8" x 10'
1—Screw Conveyor, 9" Diameter by 15' @ 50 RPM Complete with Drive Shaft 1½ HP, Motoreducer, Sprocket Chain Conveyor Box and Incidental Equipment
1—Budget Electric Hoist K.16
1—Electro Lift Hoist, 3000# Capacity Lift, 20'
2—G.E. Ignitron Rectifiers 300 KW, Serial 5472-3, 230 Volts DC; 1200 Amp; 2300 Input Volts; 60 Cycle; 3 Phase—together with Switch Gear and Circuit Breakers.
2—G.E. Pyranol Rectifier Transformers for above Rectifiers, 333 KVA; Voltage Rating 2300-240; 3 Phase, 60 Cycle, Serial Nos. 0912131-2
1—9" x 30' Portable Screw Conveyor Approximately 25 T.P.H. Complete with Drive Couplings and Other Incidental Equipment
1—8" x 5" x 61'9" Centrifugal Discharge Bucket Elevator Consisting of Shaft Drive Belt and Buckets, Steel Elevator Feed Hopper and Other Incidental Mechanism
1—Steel Weigh Hopper 5' x 5' x 8'6" High with One Toledo Model 2500 Suspension Hopper Scale 10,000# Dial with 10# Graduations
1—8" x 5" x 19'10" Centrifugal Discharge Bucket Elevator Including Shaft Drive Belts and Buckets and Other Incidental Mechanism
1—S.A. Single Power Shovel Machine Complete with Scoop Swivel Sheave Wire Rope and 5 HP Motoreducer and Standard Swinging Shovel Boom
1—Steel Silo 10' Diameter x 52' High with 12" x 12" x 25' Steel Spout

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1—General Electric Vertical Gear Reduction. Output Speed 5 R.P.M.—7½ HP. G.E. totally enclosed Motor—220 volts—3 phase—60 cycle.
1—D. O. James Steel & Spur Gear Angle Drive Size 18E R.A. Ratio 78.2 to 1. Complete with 15 H.P. totally enclosed fan cooled motor 220 volt—3 phase—60 cycle magnetic switch and push button.
1—Falk Reduction Drive D.A. 1760 rpm. 5.54 HP. ratio 18.8 to 1 with 5 HP. 1760 rpm. 220 volt. 60 cycle. 3 phase motor horizontal, and mounted on cast iron base.
1—10 HP. 3 phase totally enclosed fan cooled vertical motor with Philly Gear reducer having low speed output of 425 RPM.

AIR COMPRESSORS

1—Chicago Pneumatic 9"x8" 80 CFM @ 100# pressure.
1—GE Portable Air Compressor (on wheels) with tank, motor and control.
1—4½"x4½" Vertical Air Compressor.
1—Westinghouse Air Brake cross compound steam operated Air Compressor 130 CFM.
1—Chicago Pneumatic Air compressor 75 CFM @ 100 pounds.

AUTOCLAVES

1—42" dia. x 24'6" Vertical Forge Welded Steel 600 lbs. Pressure—1500 asis.
1—10' x 22' Vertical or Horizontal Forge Welded Steel Jacketed. 100 lbs. Pressure.

BARREL PACKER

1—Motor driven barrel packer, with screw conveyor, trough and hopper.

BLENDER

1—3'0" x 5' Cylindrical Blender with Stands and Drive.

BLOWERS

Large quantity of high and low pressure, high and low capacity blowers and fans in stock.

BOILERS

1—Cope 70 H.P. Vertical Steam Fire Tube Boiler 125#.
1—26" D x 45' long stack for above.
1—Automatic Stoker for above boiler—without motor.
1—Union Iron Works 444 HP Horizontal water tube boiler. 200# W.P.
1—7 HP Kane High Pressure Fire Tube Gas fired Boiler.
1—36" O.D. x 8'10"—30 HP Vertical high pressure boiler with injector.

CENTRIFUGAL

1—30" Suspended King and Garbor with perforated bronze basket.
1—40" Perforated basket—rubber covered, with A. C. motors.

CONDENSERS

1—Alberger Condenser—Size No. H200, 340-¾" copper tubes, 2 pass., C. I. body.
1—#2 Condenser 3' diameter x 8' high, 125-¾" tubes, steel body.
1—Condenser 3' diameter x 10' high, 125-¾" tubes, steel body.
1—Elliott Ehrhart Iron Body Surface Condenser—two pass. 245 sq. ft. Surface—½" brass tubing & Tube sheet.
1—30" x 7' All Copper Condenser with 1¼" tubes —300 sq. ft. surface.
1—Goubert Condenser with 1¼" Brass tubing—Iron body 350 sq. ft. surface.
Many others, too numerous to list.

CONVEYORS

Stock of screw, bucket and portable conveyors.

CRUSHERS

1—Eli W. Blake 15" x 9" Eccentric Jaw Crusher. Belt Driven.
1—Gruendler 2 roll smooth crusher 18" x 18½" wide. Pulley drive to jack shaft.
1—Two roll crusher (One roll 22" dia.; one roll 6" dia.)
1—#13 Quaker City Crusher—pulley drive.

SPECIALS

1—36" Sweetland pressure filter.
1—24" x 24" Sperry one eye open delivery flush plate and frame filter press.
1—24" Shriver one eye open delivery filter press chassis only.
1—24" Sperry two eye corner feed filter press chassis only.
1—42,500 gallon vertical steel tank—riveted.
1—Lydon electric furnace 1200 to 1400 degree F maximum.
1—Sentry electric heat treating furnace 3 KW.
1—Dispatch electric heat treating furnace 20 KW.

GUMMER

1—Pony Labelrite table model motor driven gummer with single phase motor.

INSTRUMENTS

1—Weston Model 44 Type C. Revolution Indicator 0-1200 RPM.
2—Brown Electric Pyrometers 1200 degrees to 2800 Degrees F.
1—Foxboro-eh Recording Thermometer 0 to 100 degrees F.
1—Tycos straight stem, glass front, separable socket thermometer.

KETTLES

2—50 gallon jacketed agitated open top C. I. kettles.
1—40 gallon jacketed copper kettle on C.I. stand.
1—26" dia. x 14" deep jacketed C.I. kettle with bolted-on C.I. cover.
1—32" dia. x 24" deep C.I. jacketed open top kettle—80 gallons capacity—on legs.
1—4' dia. x 10' deep, iron body with heating coil, agitator and drive. 3000 gal.
1—27" dia. x 22" deep copper, jacketed, lead lined on 3 legged stand.
1—6'0" dia. x 3' deep, steel jacketed, with agitator and drive. 350 gal.
1—10' dia. x 38" deep vertical pressure kettle—rubber lined.
1—6'9" x 8'0" deep iron body, Guiphonator, Propellor Agitator Drive. Tight and Loose Pulley Capacity 2000 gallons.
2—12" dia. x 3' deep, aluminum lined, jacketed agitator, drive, tight and loose pulley.
1—39" D x 4' deep vertical steel kettle.
Stock of jacketed and unjacketed kettles always on hand.

MILL AND PULVERIZERS

1—1 gallon, 2 gallon and 3 gallon laboratory pebble mills.
1—Charlotte stainless steel laboratory colloid mill with 1 hp. A.C. motor.
1—Raymond & 1 Pulverizer with 25 HP motor and 50 HP motor driven fan.
1—#1 Gruendler Hammermill with 7½ HP A.C. motor.
1—#13, Quaker City Crusher.
1—4' x 6' Throop Silex Lined pebble Mill.
1—6' x 5' Porcelain lined pebble mill. T & L pulley drive.
1—Raymond #9 Pulverizer with 25 HP A.C. motor. Raymond 4-0 Pulverizer without motor.
1—Raymond #3000 Pulverizer—belt driven.
1—Raymond #9000 Pulverizer—motor driven, complete with dust collector, separator, cyclones, tubular ducts, steel frame work.
1—3' x 5' Abbe porcelain lined mill body, no doors, stands, bearing or drive.
1—"Briton" Hammermill with blower, screen and 25 HP. A.C. motor.
1—Gruendler 2 roll smooth crusher 18" x 18½" wide. Pulley drive to jack shaft.
1—24" dia. x 28" wide ball mill.
1—6" dia. x 20" deep Muller.
1—12" 30" Kent 3 Roller Mill.
1—18" x 48" Day 3 Roller Mill.
4—Lehmann 3 Roller Water Cooled Mill.

MIXERS

4—20"x40" (12 cu. ft.) single ribbon and paddle mixers complete with drives, fully enclosed A.C. motors and starters.
1—Jacketed body Tar Mixer.
1—Sprout Waldron Grain Mixer with 12" Auger spiral.
1—25 Gallon Jacketed single shaft agitated mixer.
1—30 Gallon Tilting Mixer. T & L Pulley drive.
1—J. H. Day Single Blade Mixer 30" W x 36" L.
1—J. H. Day "Hercules" 6 Barrel heavy duty, tilting type mixer with A.C. Motors.

PUMPS

2—250 Blackmer Rotary Pumps 60 GPM with 5 HP AC motors.
1—4½" x 2¾" x 4" Worthington Duplex Steam pump.
1—7½" x 4½" x 10" Worthington Duplex Steam Pump.
1—7" x 5" 6" Worthington Duplex Steam Pump.
1—Wilbey 2" x 1½" 80/30 GPM @ 150' head centrifugal pump with 7½ HP AC motor.
Vacuum pumps, rotary, centrifugal and gear pumps in stock.

REFRIGERATION UNIT

1—American Carbonic Model VS-2 Refrigeration Unit Type CO2—capacity 5 ton.

SCALES

1—500 lb. portable platform scale.
1—1000 # Fairbanks semi-portable scale.
1—1500 # Portable platform scale (37" x 48½").
1—10000 # Platform scale 8'0".

SEPARATORS

1—Dings High Intensity Magnetic Separator.
1—3 foot dia. Gayco Separator, with motor drive.

STERILIZER

1—Bramhall Deane sterilizer (or disinfector). Inside dimensions 2'6" wide x 4' high x 7' long.

TANKS

From 50 gallons to 7000 gallons in stock. All kinds. Also a quantity of mixing tanks, with agitators. Some with motors, others belt driven. Advise your requirements.

TRUCKS

3—6,000 lb. capacity hand lift trucks.
1—10,000 lb. capacity hand lift truck.
3—Elwell Parker Lift Trucks, Model EC. 4000 lbs. capacity with Edison Storage battery.

VIBRATING SCREENS

1—Jeffrey Traylor Type 4—Vibrating Conveyor Screen.
1—Deister 3' x 6' Concentrator, Type C, single surface Leahy Heavy Duty Vibrating Screen with 1 HP motor—440 volt—3 phase—60 cycle.

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1—New 25,000 gallon Rubber Lined Tank. Agitators, Mixers, Labelers, Fillers, Stainless Steel Tanks & Kettles, Roller & Belt Conveyors, etc.

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6—25,000 gal. Horiz. 10'8" x 38'8" Shell 3/8"
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WITH OR WITHOUT AIR SEPARATION

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3—375 KVA Worthington 2300 V.

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(Most are new)

No.	Sq. Ft.	Make	Passes	Tubes	
1	9533	Bethlehem	1	Brass	¾"
4	3300	Str. Wells	2	Alu-Brass	¾"
1	2200	Alco	2	Cu Ni	¾"
4	1050	Conseco	2	Cu Ni	⅝"
1	750	Bethlehem	2	Brass	⅝"
30	400	All. Chalm	2	Brass	⅝"
4	300	Wheeler	2	Cu Ni	
8	155	Conseco	2	Brass	¾"
44	349	Luboil Coolers		Cu Ni	⅝"

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100 to 300 gal. Stainless Steel Mixing Tanks.
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DRYERS

14—2 Truck Atmospheric Steam Heated Dryers, 500 sq. ft. drying surface each.
1—Devine 3'x14' stainless clad Rotary Dryer.
5—Allis Chalmers 9'x160', 9'x80' Rotary Kilns.
1—Vulcan 8'x125' Rotary Kiln.
2—Bonnot 5'x40', 3'x45' Rotary Dryers.
2—Ruggles-Coles Dryers 70"x35', 4'x28'.
5—Rotary Vacuum Dryers 36"x8', 4'x28', 5'x30'.
2—Bufflovak Vacuum Shelf Dryers each with 20—42"x42" shelves.
2—Bufflovak 32"x90" Atmospheric Double Drum Dryers.
1—Pfaudler 2'x10' glass-lined Rotary Dryer.

PULVERIZERS—MILLS

5—Abbe 6'x8', 5'x4' porcelain lined, jacketed Pebble Mills, motor driven.
1—Patterson 3'x4' steel lined Ball Mill.
1—Porter Multiple Jar Mill, 4—1 gal. jars, motor driven.
3—Porcelain lined Pebble Mills 3'x4', 2'x3'.
3—Mikro Pulverizers 3TH, 2TH, 1SH.
1—Fitzpatrick Type D Comminuter S. S.
2—Hardinge 3'x24", 6'x22" Conical Mills.
4—Raymond #10 and #50 Imp. Mills.
3—Raymond #20 and #00 Screen Mills.
1—Raymond 5 Roll High Side Mill #5057.
2—Dixie Hammer Mills #3020, #2434.
1—"Jay Bee" Hammer Mill size 2UX.
2—Tyler-Hummer 3'x5', 4'x5' Screens.

FILTERS

1—Sweetland #5 stainless clad.
1—Oliver 5'4"x8' Acid Vacuum Rotary.
2—Sweetland Filters #7 and #2.
2—Sperry 30"x30", 24"x24" Wood P&F.
2—Sperry 24"x24" Cast Iron P&F.
4—Sperry Type 36"x36" Cast Iron P&F.
3—Sperry 42"x42" Aluminum P&F.

CRYSTALLIZERS—KETTLES—TANKS

4—1000 gal. steel, closed, jacketed Tanks.
1—Struthers-Wells 400 gal. closed, jacketed, agitated Pressure Kettle, 5 Hp motor.
4—Bufflovak 6' Crystallizers, Vacuum and Atmospheric.
6—Dopp 250, 150 gal. steam jacketed, agitated Kettles, high pressure.
3—Pfaudler 75, 100, 150 gal. glass-lined, steam jacketed, agitated Kettles.
10—Metal Glass 25 to 100 gal. Tanks.
25—Stainless Steel Kettles, Tanks, 50 to 500 gal.

CENTRIFUGALS

2—AT&M 48" stainless steel suspended, solid baskets, 30 HP motors.
4—AT&M 40" suspended, copper perforated.
8—AT&M 40" copper perforated baskets, bottom discharge Sugar Centrifugals.
1—Fletcher 18" stainless steel, motor driven.
1—Tolhurst 26" stainless steel, motor driven.
1—Sharples #6 Pressuretite Centrifuge.
4—Sharples #6 Super Centrifuges, 3 HP.
2—Sharples #16 Vaperite Centrifuges, stainless bowls, 2 HP motors.

MIXERS—ALL TYPES

2—Day #81 Re-Ball 40"x120" stainless steel filters or Screeners.
1—Readco stainless 4 gal. Mixer.
2—Baker Perkins 50 gal., sigma blades.
1—Baker Perkins 100 gal. stainless steel clad, steam jacketed double arm Mixer.
1—Baker Perkins 4½ gal. Model BSC, heavy duty double arm jacketed Vacuum Mixer and Condenser.
15—Portable Electric Agitators, ¼ to 2 HP.
8—"Lightnin" top entering Agitators, 3 HP.
1—Robinson 1000-lb. rubber-lined Batch Mixer, stainless steel agitator.
1—1000-lb. steel, steam jacketed Mixer.
25—New and used Powder Mixers, 150 to 4000 pounds.
2—Day 8 and 40 gal. Pony Mixers.

EVAPORATORS—PANS—STILLS

2—Goslin Birmingham Sextuple Effect Evaporators, 50,300 sq. ft. area.
1—Swenson Quad. Effect Evaporator, 60,000 pounds water per hour evaporation.
6—Copper Vacuum Pans 24", 42, 4', 6' dia.
1—Struthers-Wells 12" Steel Column.
1—Complete installation of 1—30"x30' Copper Rectifying Column with 30"x45' Copper Beer Column, Preheater, Dephlegmator, Condensers, Coolers, Instruments.

MISCELLANEOUS

14—Olivite Acid Centrifugals 2" Pumps.
1—Nash #3 Vacuum Pump, 300 cfm.
2—Fuller-Kinyon 4", 5" Pumps.
2—Pyrex 2"x1½" glass centrifugal Pumps.
1—Lot of Celeron piping, fittings.
1500 ft. 16", 18", 24" Roller Conveyor.
5—Bucket Elevators 20' to 75' centers.
300 ft. 9", 12" Steel Screw Conveyor.

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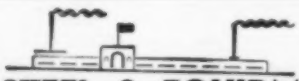
GOOD USED PROCESSING EQUIPMENT

6—Andersen No. 1 Expellers, Cookers & Dryers.
2—Dopp Closed Agit. Jack. Kettles, one Duplex Acid Resistant.
4—Baker Perkins heavy duty Jack. Mixers, 200, 100, 50, 9 & 7 gal.
1—LEHMAN 4 Roll W.C 12"x36" Steel Mill 20 HP. Motor.
1—Hardinge Conical Ball Mill 4½'x24".
1—Devine Vac. Shelf Dryer, 9 Shelves 42" Sq.
2—Devine 2'3 Van. 4 Shelf Dryers. Elec. Heated.
1—Buffalo Vac. Drum Dryer, 24"x20".
1—Badger 42" dia. Monel Bubble Cap Column.
4—Albright-Nell 4'x8' Atmos. Drum Dryers & Flakers.
6—Pony or Paste Mixers, 8, 15 & 40 gals.
3—Lehmen & Ross 3 Roll Mills, 7"x9", 9"x32", 12"x30" & 16"x40".
1—Abbe & Learmister Rotary Cutters 5 HP. Motor.
3—Hoschin 18"x30", 4 Roll Granite Stone Mills.
6—Farrel & Thropp Rubber Mills 30", 38", 40", 48", 60" & 84".
3—Rubber Calenders, 30", 54" & 60".
3—Rubber Tubers & Extruders, 2½" to 6" & Banbury Mixers.
6—Tyler 30 Jr. Hummer Screens 24"x60" & 20"x80" Split Screen.
1—Sprout Waldron 40"x84" Single Deck Sifter, Motor Driven.
2—Orville Simpson 20"x40" & 48"x80" Rotex Sifters.
1—500 gal. Closed Jack. Steel Kettle or Still.
1—Devine 800 gal. Steel Kettle.
1—Devine 1000 gal. closed Steel Kettle.
1—250 gal. Lead Lined Kettle.
3—Shriver 18"x24" sq. Wood Plate & Frame Filter Presses.
12—Sperry & Shriver 18", 24", 30", 32" & 42" Filter Presses.
2—Sperry 18" Lead & 2 Shriver 18" & 24" Wood Filter Presses.
38—Frames & 35 Plates for Sperry 36", closed del. Iron Filter Press.
1—Shriver 30" Sq. Pl. & Fr. Iron Filter Press. Also Sperry 24" Recessed.
10—Tolhurst 40" Suspended Type Centrifugals Bottom Discharge.
1—Tolhurst 36" Rubber Lined Centrifugal. Other sizes 30" to 48".
11—Sharples #5A Stainless Steel Oil Centrifuges, 2 HP., latest type.
1—Sharples No. 6 Centrifuge, 2 HP.
4—Stokes RD 4, 1-3/16" Rotary Tablet Machines, also ¼", 1" & 1¼", also single punch.
1—U. S. Stainless Steel Colloid Mill 5 HP., M.D.
Injection Molding Machines, 2 oz. to 16 oz.
1—Huber Type 35 Ton Pure Block Press.
2—Manton-Gaulin Stainless Steel Homogenizers.
1—Sturtevant #20 Swing Hammer Mill.
10—Day Dry Mixers 50, 100, 500, 800, 1000 & 2500 lbs.
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3—Duriron 3"x2" Centrifugal Pumps.
1—Burkhard 38" Copper Revolving Pan.
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4—Stokes & Day Powder Filling Machines.
2—Abbe #15 Bluteryess Turbine Sifters.
1—Colton Hand Operated Tube & Jar Filler.
1—Standard Automatic Samco Jr. Vac. Bottle Filler.
10—New Stainless Steel Tanks, 100 to 3000 gals. open & closed.
12—Alum. Jacketed Kettles, 30 to 100 gals.
10—Stainless Steel Jack. Kettles, New & Used, 30 to 500 gals.
13—Copper Jack. Kettles, 2, 20, 50, 75, 100, 250 & 350 gals.
8—Pfaudler Glass Lined, Jack. Agitated Kettles, 350, 400 & 500 gals.
5—Mikro Pulverizers, Lab. to 60 HP.
15—New Portable Electric Agitators, ¼ to 2 HP.
4—Abbe Pebble Mills 6'x8', 60"x48", 30"x33" & 24"x36".
8—Abbe Jar Mills Lab. to 2 gal. sizes, Single, Double & up to 8 Jars.
1—Williams #3 "Regular" Type Hammer Mill.
2—Hammer Mills 1 HP. to 50 HP. Sturtevant, Jeffrey, Stedman, etc.
1—Stedman 32" Model A Spike Crusher.
Sturtevant 36" Rock Emery Mill & Robinson #10 Saw Tooth Crusher.
2—/0000 & #0 Raymond Mills.
1—Blystone 2000 lbs. Jack. Horiz. Spiral & Paddle Type Steel Mixer.
1—Faust 150 gal. Jack. Spiral Steel Mixer.
3—DeLaval Multiple Clarifiers, #300 & #301, Motor Driven.
1—Sprout Waldon 16" B.B. Attrition Mill, two 7½ HP. motors.
6—Attrition Mills & Disc Grinders.
2—Worthington 12"x12"x12" Vacuum Pumps.
4—Stokes Vert. High Vac. Pumps.
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P & H	700	65 ft.	1½ yd.-20 ton	Diesel
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Link Belt	TC 90 (Truck Crane)	60 ft.	1¼ yd.-20 ton	Gasoline
Ohio	Locomotive Crane	50 ft.	30 ton	Oil Fired Steam

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242 CFM 75# 9-10x9 Ingersoll FSI
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1—s/s 6' dia. x 19'6" high, vac. jkt'd. pan complete with 2-stage Elliott steam ejector.
2—Shriver 30" x 30" C.I. c. d., washing type filter presses—29 chambers. 2" frames.
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2 Bird continuous Centrifugal Filters, 36" x 50"; 36 x 72".
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12 DeLaval and Sharples Centrifugal Extractors, Separators and Clarifiers.
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12 Oliver, Feinc, Kelly Filters from Lab., size to 11'6" x 18'; specifications on request.
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25 Hammermills and Grinders by Williams, Jeffrey, Gruendler, Stedman, Raymond, Mikro, others.
4 Mikro Pulverizers, Bantam to No. 4's with motors.
15 Fitzpatrick Comminuters, Model D, in stainless.
1 New Triple Effect Long Tube Copper Evaporator, 3100 sq. ft. Total number of tubes, 336.
1 Buffalo Stainless Evaporator, single effect, 900 sq. ft. forced circulation, ext. calandria type.
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1 Stainless 550 gal. jacketed and agitated Reactor with Reflux and Tubular Condenser.
15 Autoclaves and Reactors in cast iron, steel, stainless, some with agitators and jackets.
3 Dopp 200 gal. Jacketed Kettles.
1 Doppley 700 gal. Jacketed and Agitated Pressure Kettle.
1 Aluminum 1300 gal. Jacketed and Agitated Still.
3 Devine Vacuum Shelf Dryers, No. 11—40" x 43".
8 Single and Double Drum Atmospheric Dryers, from 2' x 3' to 5' x 12'.
2 Bartlett & Snow Stainless Vac. Pan Dryers: 7'10" x 2'11".
1 Buflovak Nickel Rotary Vac. Dryer, 5' x 30'.
2 Struthers Wells Stainless Atmospheric Drum Dryers, 5' x 4', and 5' x 10'.
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6 Truck and Tray Dryers, steam or electrically heated, several sizes.
4 Louisville Steam Tube Dryers: 3' x 20'; 4'6" x 25'; 6' x 25'; 5'6" x 30', and 6' x 50'.
2 Huhn Steam Tube Dryers: 24" x 11'6" and 30" x 10'.
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8 Good used Swenson, Devine and Buffalo single, double and triple effect Evaporators in copper tinned, cast iron with heresite lining and steel accesseries installed.
50 Heavy Duty Horizontal Jacketed Mixers, with double arms, sigma or nabon; geared both ends, tilting; 100 gals. working.
3 Baker-Perkins Jacketed Mixers, 10 gal., 50 gal., and 75 gal., 2 unjacketed S. S. Lab. Size Mixers.
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3 Lancaster Type EBG4 Counter Current Stainless Batch Mixers.
10 J. H. DayRo-Ball Sifters, screen size 40" x 84" and 40" x 120".
6 Tyler Hummer Screens, multiple separations, state size and type.
6 Tube and Rod Mills up to 21'.
5 Continuous Ball Mills, 3' x 3' up to Hardinge Conical Mill, 8' x 30'.
7 Pebble and Ball Mills, 24" x 30" to 6' x 8'.
10 Roller Mills Lab. size to 16" x 40", standard makes.
40 Tablet Machines and Preforming Presses by Stokes, Colton and Kux up to 50 ton; state requirements; single punch and rotary models.
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60 HP	NEW	1200 RPM	TEFC
60 HP	NEW	900 RPM	TEFC
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40 HP	NEW	1200 RPM	TEFC

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35 KW DC 48 v. 750 amp., AC drive.
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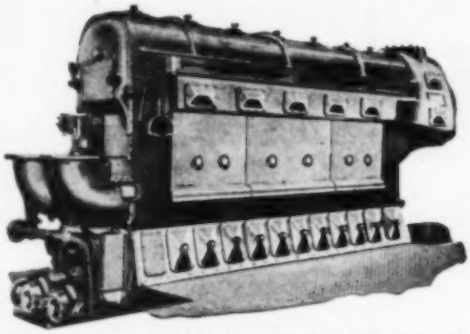
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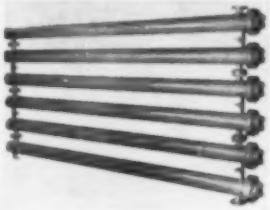
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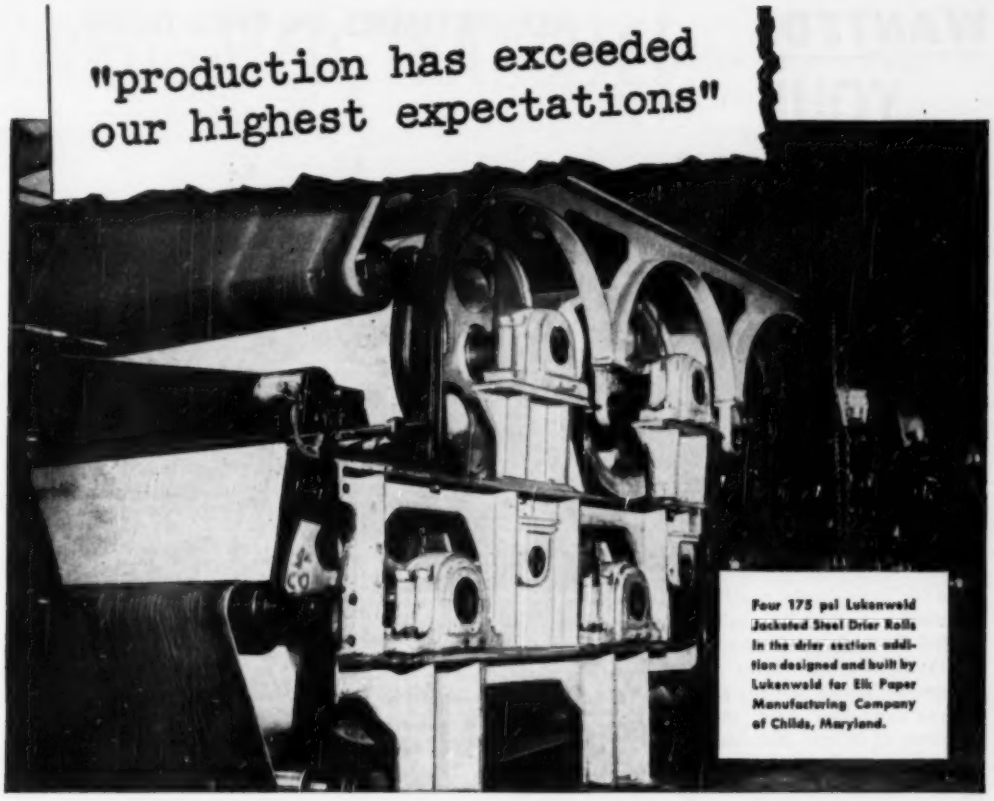
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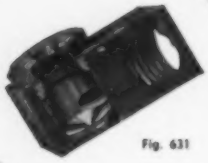


Fig. 631

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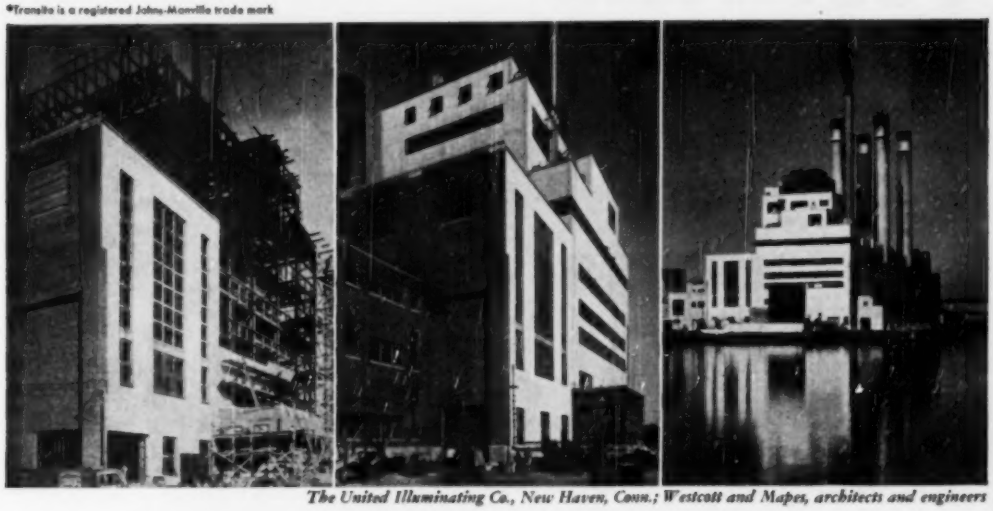
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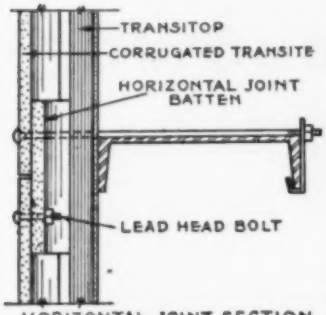
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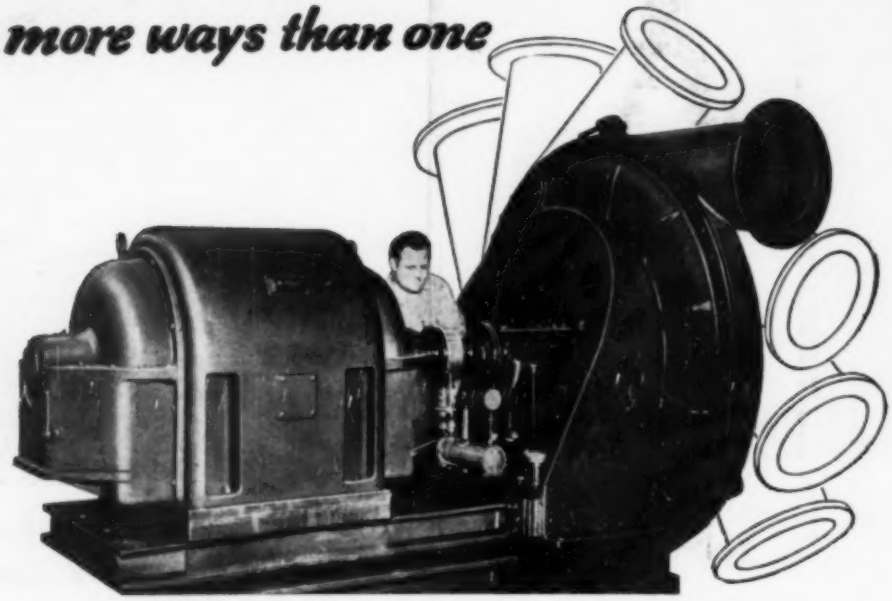
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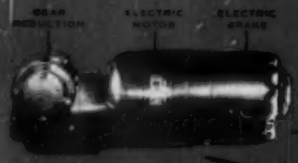
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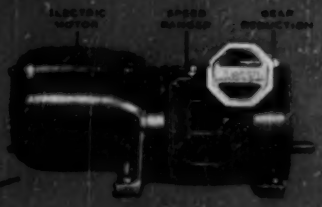


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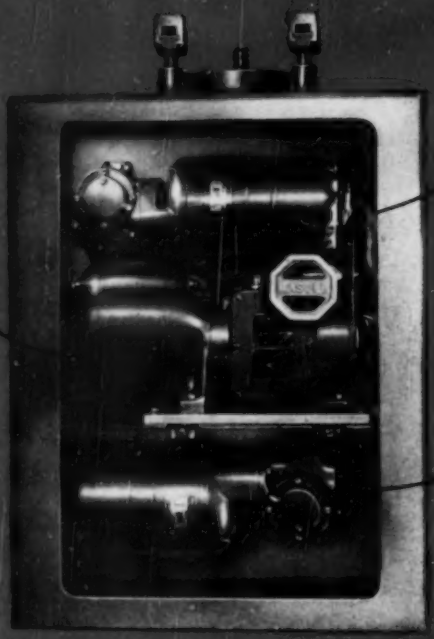
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